FINAL SUBMITTAL

ENERGY SURVEYS OF
ARMY INDUSTRIAL FACILITIES
ENERGY ENGINEERING ANALYSIS PROGRAM
LETTERKENNY ARMY DEPOT
CHAMBERSBURG, PENNSYLVANIA

VOLUME IV

PROGRAMMING DOCUMENTS

CONTRACT NO. DACA65-91-C-0071

PREPARED FOR:

U.S. ARMY CORPS OF ENGINEERS
NORFOLK, VIRGINIA

PREPARED BY:

ENERGY AND ENVIRONMENTAL SERVICES DEPARTMENT
REYNOLDS, SMITH AND HILLS, INC.
P.O. BOX 4850
JACKSONVILLE, FLORIDA 32201
904/279-2277

RS&H PROJECT NO. 2900379001

JANUARY 1992

TABLE OF CONTENTS

QRIP

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS
For use of this form, see AR 5-4; the proponent agency is OCA.

1. PROJECT NO.: AMC QRIP

REQUIREMENT CONTROL SYMBOL DD-M(R) 1561

2. TO:
HQ DA
Attn: DACS-DME
Pentagon
Washington, DC 20310-2070

3. THRU:
US AMC
Attn: AMCMM-M
5001 Eisenhower Ave
Alexandria, VA 22303-0001

4. FROM:
Commander
US DESCOM
Attn: AMSDS-RM-P
Chambersburg, PA 17201-4170

5. DOD COMP NAME: Army

6. DOD COMP CODE: A

7. COMMAND CODE: W730KK

8. DATE: 10/9/91

9. PROJECT TITLE: Compressed Air Shut-Off Valves

10. TYPE OF PROJECT (Check one): [X] QRIP [ ] OSD PIF [ ] PECIP

11. AMORTIZATION YEARS/MONTHS: $ 8,108 (Project Cost) ÷ 4,004 (Average Annual Savings) X 12 (No. Mos) = 2.0 (years) or _____ (months) (amortization)

12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR: 024

13. ECONOMIC LIFE:

14. EXPECTED OPERATIONAL DATE:

15. SUBMITTING UNIT(S):
Commander
Letterkenny Army Depot
Attn: SDSLE-EM (T. Hagie)
Bldg. 663
Chambersburg, PA 17201-4150

16. UNIT ID CODE:

17. PROJECT DESCRIPTION:
Replace existing compressed gate-type shut-off valves with ball valve type.

18. DETAILED JUSTIFICATION:
Unlike gate valves, ball valves shut off quickly with a single motion through a 90^{0} angle. It requires little access, on-off position is easily identified and is less susceptible to leaking.

19. SAVINGS DISPOSITION:
Savings are used to reduce energy expenditures

20. OTHER REMARKS (Continue on page 5, if more space is needed)

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

21a. SUMMARY OF DOLLAR SAVINGS
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY *(Identify)* Electricity	$4,004	$0	$0	$0	$0	$4,004	$4,004	$4,004	$4,004
CONTRACT COSTS									
OTHER *(Identify)*									
TOTALS	$4,004	$0	$0	$0	$0	$4,004	$4,004	$4,004	$4,004

b. PRIORITIZATION

(1) INTERNAL RATE OF RETURN *(IRR)*

Divide estimated project cost 8,108 by average annual savings 4,004 = 2.0 factor.

Based on factor and number of years economic life of the project, select the IRR from Table H-3, App H, Ch. 5, AR 5-4 = .66 % IRR.

(2) SAVINGS TO INVESTMENT RATIO *(S/I)*

Multiply annual savings 4,004 X discount factor 9.524 = 38,134 and divide by present value of investment *(undiscounted)* 8,108 = 4.70 S/I.

(Based on economic life 25 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) RATE OF INVESTMENT PER MANPOWER SPACE *(RIMS)* N/A

Divide estimated project cost _____ by number of manpower space savings _____ = _____ RIMS.

(Manpower requivalents cannot be used in this computation.)

Page 2 of DA Form 5108-R

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)—Continued.

22. COST FOR PROJECT TO BECOME OPERATIONAL

EQUIPMENT TYPE a	PROPOSED SOURCE OF PROCUREMENT b	UNIT PRICE c	QUANTITY d	TOTAL COST e	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT f	FY FUNDS REQUIRED g
(1) Compressed air ball valves		$35.56	228	$8,108		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION *(Equipment delivery)*						
(7) EQUIPMENT MODIFICATION[1]						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT[2]						
(10) FACILITIES MODIFICATION[3]						
(11) TRAINING						
(12) OTHER *(Specify)*:						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL[4]				$8,108		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				$8,108		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE[5]						
(16) TOTAL *(Sum of (14) + (15) above)*				$8,108		

[1] *Not to exceed 10% of equipment cost for QRIP projects.*

[2] *Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.*

[3] *Normally not OPA funded.*

[4] *Used to compute amortization in Item 11.*

[5] *Specify source to include certification that funds are available, if financed from the regular budget:*

Page 3 of DA Form 5108-R

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)—Continued.

23. SUMMARY OF SAVINGS *(MANPOWER AND DOLLARS)*

ITEMS	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR	TYPE PERS[6]	DOLLARS	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
a	b	c	d	e. FROM	f. TO	g. FROM	h. TO	i. FROM	j. TO
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS[7]									
(7) OTHER DOLLAR SAVINGS *(Excluding Manpower)*, e.g., CONTRACT COSTS & UTILITIES									
(8) Electricity			$4,004						
(9)									
(10)									
(11) TOTAL DOLLAR SAVINGS			$4,004						

[6] *(1) US Graded*
(2) US Wage Board
(3) DHFN
(4) IHFN
(5) Officer
(6) WO
(7) Enlisted

[7] *Reflect specific duties being performed with additional manhours available (equivalent manyears)*

Page 4 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

24. REGULATORY APPROVAL/COORDINATION		
a. INVESTMENT STATEMENT This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints. (Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)		
b. OTHER COORDINATION (Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)		
25. SUBMITTED BY (Typed name, grade and title of Subordinate Command/Agency or Project Initiator)	SIGNATURE	DATE (YYMMDD) AUTOVON
26. APPROVAL RECOMMENDED BY (MACOM/Agency)	SIGNATURE	DATE (YYMMDD) AUTOVON
FOR USE BY HQDA ON OSD PIF PROJECTS ONLY		
27. APPROVED BY	SIGNATURE	DATE (YYMMDD) AUTOVON
28. OTHER REMARKS (Cont'd)		

Page 5 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

ECO Number: 1

COMPRESSED AIR VALVE REPLACEMENT IN BUILDING 350

Discussion

Building 350 is constructed with a one-inch diameter compressed air supply on each of the 228 columns. Typically, these air stations are arranged with a shut-off gate valve followed by one or more quick disconnect compressed air hose fittings. The problem is that many of the air stations are leaking compressed air continuously.

All the leaks are in valve stem packings or hose connections downstream of the manual, gate-type, shut-off valve located on the column. Typically, these valves are left open all the time, allowing the compressed air to leak out. The background noise is too high to hear the leaks, and the workmen often wear gloves so they cannot feel them either. It is cumbersome to shut off a gate valve which requires multiple turns, particularly if access to it is blocked by surrounding equipment. A ball valve shuts off quickly (requiring on a single motion through 90° angle), requires little excess, and is less susceptible to leaking.

Based on the results of a leak survey (see Appendix B), it is estimated that about half of the 228 columns in Building 350, have a detectable leak. These leaks total 85 cfm and cost approximately $4,000 annually.

Recommendations

It is recommended that the compressed air shut-off valve on each column in Building 350 be changed from the existing gate valve to a ball valve; and that this new valve be closed at all times when compressed air is not in use. Typically, this would be at the end of a workman's shift.

Construction Cost	$7,271
Annual Energy Savings (MBtu/yr)	
Electricity	366
Annual Energy Cost Savings ($/yr)	$4,004
SIR	7.5
Simple Payback (years)	2.0

LIFE CYCLE COST ANALYSIS SUMMARY — STUDY: ECO1
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) — LCCID 1.062
INSTALLATION & LOCATION: LETTERKENNY ARREGION NOS. 3 CENSUS: 1
PROJECT NO. & TITLE: ECO #1 COMPRESSED AIR VALVE REPLACEMENT
FISCAL YEAR 1991 DISCRETE PORTION NAME: TOTAL PROJECT
ANALYSIS DATE: 09-11-91 ECONOMIC LIFE 25 YEARS PREPARED BY: G. FALLON

1. INVESTMENT

A. CONSTRUCTION COST	$ 7271.
B. SIOH	$ 400.
C. DESIGN COST	$ 437.
D. SALVAGE VALUE COST	-$ 0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	$ 8108.

2. ENERGY SAVINGS (+) / COST (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	$ 10.94	366.	$ 4004.	15.11	60501.
B. DIST	$ 7.43	0.	$ 0.	21.31	0.
C. RESID	$ 6.61	0.	$ 0.	25.22	0.
D. NAT G	$ .00	0.	$ 0.	20.70	0.
E. COAL	$ .00	0.	$ 0.	15.93	0.
F. TOTAL		366.	$ 4004.		$ 60501.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)		$ 0.
(1) DISCOUNT FACTOR (TABLE A)	14.53	
(2) DISCOUNTED SAVING/COST (3A X 3A1)		$ 0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)		$ 0.

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 19965.
A IF 3D1 IS = OR > 3C GO TO ITEM 4
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)_____
C IF 3D1B IS = > 1 GO TO ITEM 4
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YRS ECONOMIC LIFE)) $ 4004.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 60501.

6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 7.46
(IF < 1 PROJECT DOES NOT QUALIFY)

7. SIMPLE PAYBACK PERIOD (ESTIMATED) SPB=1F/4 2.02

RS&H

SUBJECT LETTERKENNY A.D. ECO #1

AEP NO 290-0379-001

SHEET 1 OF

DESIGNER G. FALLON

DATE

CHECKER P. Hutchins

DATE

ECO #1 Compressed Air Valve Replacement in Bldg 350

EACH COLUMN CONTAINS AT LEAST ONE COMPRESSED AIR ROOT VALVE. DRAWINGS SHOW 4 ROWS OF 57 COLUMNS EACH, TOTAL 228 COLUMNS => 228 ± AIR STATIONS. 40 COL'S HAD LEAKS.

COLUMNS SURVEYED

B19 THRU B57 AND C11 THRU C57 => 84 COL'S

PERCENT W/LEAKS

$$\frac{40}{84} \times 100 = 47.62\%$$

ESTIMATED COL'S W/LEAKS

228 COL'S × .4762 = 109 COL'S.

TOTAL ESTIMATED LEAKAGE

Σ LEAKS = 31 CFM

$$\frac{31 \text{ CFM}}{40 \text{ COL'S}} \times 109 \text{ COL'S} = 84.5 \text{ CFM.}$$

TOTAL VALUE OF LEAKS

$$84.5 \text{ CFM} \times \frac{60 \text{ M}}{\text{H}} \times \frac{8760 \text{ H}}{\text{YR.}} \times \frac{0.009 \text{ MBTU}}{1000 \text{ cf}} \times \frac{\$10.94}{\text{MBTU}} \approx \$4000/\text{YR}$$

TOTAL ENERGY SAVED

$$\frac{\$4000}{\text{YR}} \times \frac{\text{MBTU}}{\$10.94} = 366 \text{ MBTU/YR.}$$

RSH

Telephone Call Confirmation

(704) 529-2104

Project No. 290-0379-001

Local ____ L.D. ✓ Placed ✓ Rec'd. ____ Date ____

Gr. Fallon Conversed With Tom Knowland

Of Ingersol-Rand Regarding Compressor Energy Use

TK gave the following energy use values:

CFM	Bhp	PSIG	Btuh/CFM	kwh/kcf	MBTU/kcf
1595	319	110	509	2.70	0.0092
1560	330	125	538	2.86	0.0098
1603	306	100	485	2.57	0.0088

CALC ENERGY USE PER [redacted] CFM OF AIR

MOTOR EFF = 0.92

Distribution:

RS&H®

SUBJECT LEAD ECO #1 AEP NO

SHEET 2 OF

DESIGNER G. Fallon DATE

CHECKER P. Hutchins DATE

COST of BALL VALVE

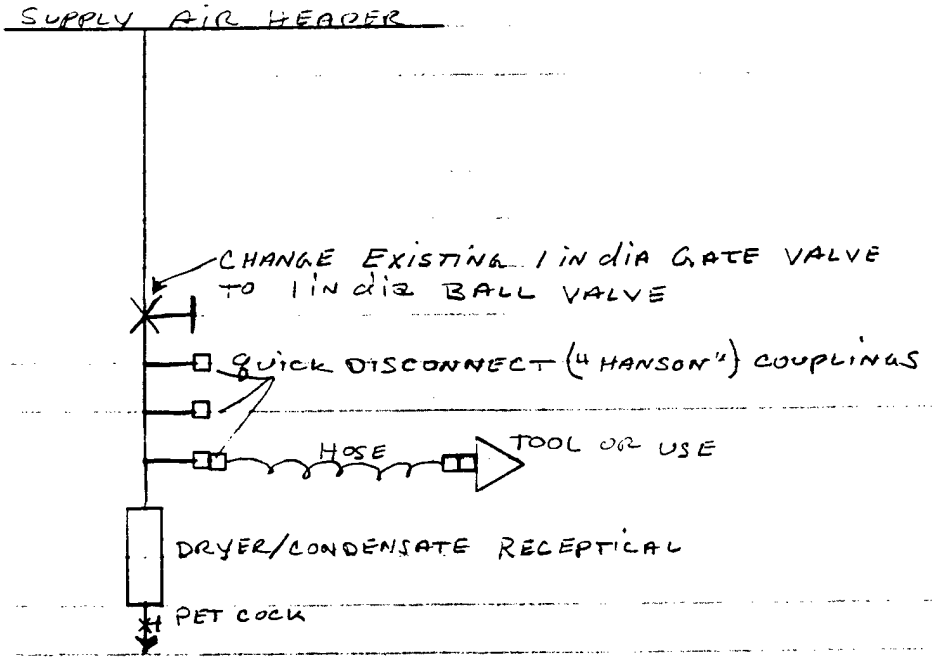
FROM MEANS, ITEM 151-955-1470
AND FROM CONSTRUCTION COST CALCULATION (ATTACHED)

228 VALVES = $8131

PAYBACK

$\frac{\$8131}{\$4000/yr} = 2.0$ years

SKETCH



NOTE: EXISTING GATE VALVE OFTEN HAS LEAKY VALVE STEM AND ARE RARELY CLOSED. THIS ALLOWS DOWNSTREAM LEAKS TO CONTINUE. VALVE IS "DIFFICULT" TO SHUT OFF. BALL VALVE IS QUICK SHUT OFF TYPE. Therefor MORE LIKELY TO BE SHUT OFF BY WORKERS WHEN ASKED TO DO SO.

05/09/91

ECO Construction Cost Estimate
Calculations

ECO Name: Air Valves Replacement in Building 350

ECO #: 1

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$2,109
Labor	$2,440
Subtotal bare costs	$4,549
FICA Insurance (20% of Labor)	$488
Sales Tax (6.5% of Material)	$137
Subtotal	$5,174
Overhead (15%)	$776
Subtotal	$5,950
Profit (10%)	$595
Subtotal	$6,545
Bond (1%)	$65
Subtotal	$6,610
Contingency (10%)	$661
Subtotal (Construction Cost Input For LCCID *)	$7,271
SIOH (5.5% of Construction Cost)	$400
Subtotal	$7,671
Design (6% of Construction Cost)	$436
Total Project Cost	$8,107

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE

DATE PREPARED

SHEET OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: Letterkenny Army Depot

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE

- ☐ CODE A (No design completed)
- ☐ CODE B (Preliminary design)
- ☐ CODE C (Final design)
- ☐ OTHER (Specify) _____

DRAWING NO.

ESTIMATOR: G. Fallon

CHECKED BY

ECO #1 SUMMARY

	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
1 IN Ø BALL VALVE	228	EA	10.70	2440	9.25	2109	4549

* U.S. GOVERNMENT PRINTING OFFICE : 1959 O—516140

(TRANSLUCENT)

ECO #1

LETTERKENNY ARMY DEPOT
COMPRESSED AIR SURVEY
BUILDING 350

COLUMN/ LOCATION ID	LEAK* DETECTION TECHNIQUE	FLOW** (CFM)	COMMENT
B26	A	0.659	VALVE PACKING (MEASURED)
B54	A	1	VALVE PACKING
C24	A	1.5	1 HOSE COUPLING
C28	A	1.5	DRYER DRAIN
C32	A	1.5	VALVE PACKING
C47	A	1	VALVE PACKING
PB60	A	4.1	DRYER DRAIN PAINT BOOTH 60 (MEASURED
B19	D	<0.5	VALVE PACKING (MEASURED)
B23	D	<0.5	VALVE PACKING
B27	D	<0.5	HOSE COUPLING
B30	D	<0.5	HOSE COUPLING
B31	D	<0.5	HOSE COUPLING
B35	D	<1.5	3 HOSE COUPLING
B36	D	<0.5	1 HOSE COUPLING
B37	D	<0.5	1 HOSE COUPLING (BREATHABLE AIR)
B38	D	>0.5	1 HOSE COUPLING
B50	D	<0.5	VALVE PACKING
C21	D	<0.5	1 HOSE COUPLING
C36	D	<0.5	1 HOSE COUPLING
C38	D	<0.5	VALVE PACKING (BREATHABLE AIR)
C39	D	<0.5	VALVE PACKING (BREATHABLE AIR)
C42	D	<0.5	VALVE PACKING
C46	D	<0.5	1 HOSE COUPLING
C51	D	<0.5	1 HOSE COUPLING
C52	D	<0.5	1 HOSE COUPLING
C54	D	<0.5	1 HOSE COUPLING
C55	D	<0.5	DRAIN COCK
B39	F	1	1 HOSE COUPLING
B46	F	1	VALVE PACKING (MEASURED)
B48	F	1	VALVE PACKING
B51	F	1	VALVE PACKING
B55	F	1	DRAIN COCK
C11	F	<1	1 HOSE COUPLING
C13	F	<1	1 HOSE COUPLING
C14	F	1	DRYER DRAIN
C17	F	<1	1 HOSE COUPLING
C18	F	<1	1 HOSE COUPLING
C23	F	1	1 HOSE COUPLING
C25	F	1	1 HOSE COUPLING
C31	F	1	1 HOSE COUPLING
C45	F	1	VALVE PACKING

31

* A = AUDIBLE TO HUMAN EAR WITH "AT WORK" BACKGROUND NOISE
D = DETECTOR ONLY. LEAK COULD NOT BE HEARD OR FELT
F = CAN BE FELT WITH HAND

** FLOW WAS MEASURED IN EACH OF THE MAJOR CATAGORIES (A,D,F).
FLOW WAS ESTIMATED BASED ON CATAGORY OF DETECTION SENSITIVITY

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS
For use of this form, see AR 5-4; the proponent agency is OCA.

1. PROJECT NO.: AMC QRIP

REQUIREMENT CONTROL SYMBOL DD-M(R) 1561

2. TO:
HQ DA
Attn: DACS-DME
Pentagon
Washington, DC 20310-2070

3. THRU:
US AMC
Attn: AMCMM-M
5001 Eisenhower Ave
Alexandria, VA 22303-0001

4. FROM:
Commander
US DESCOM
Attn: AMSDS-RM-P
Chambersburg, PA 17201-4170

5. DOD COMP NAME: Army

6. DOD COMP CODE: A

7. COMMAND CODE: W73QKK

8. DATE: 10/9/91

9. PROJECT TITLE: Condensate Heat Recovery

10. TYPE OF PROJECT (Check one): [X] QRIP [ ] OSD PIF [ ] PECIP

11. AMORTIZATION YEARS/MONTHS: $ 2,703 (Project Cost) ÷ 4,100 (Average Annual Savings) X 12 (No. Mos) = 0.7 (years) or _____ (months) (amortization)

12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR: 024

13. ECONOMIC LIFE: 25

14. EXPECTED OPERATIONAL DATE:

15. SUBMITTING UNIT(S):
Commander
Letterkenny Army Depot
Attn: SDSLE-EM (T. Hagie)
Bldg. 663
Chambersburg, PA 17201-4150

16. UNIT ID CODE:

17. PROJECT DESCRIPTION:
Recover heat from dip tanks condensate which is otherwise disposed as industrial waste water.

18. DETAILED JUSTIFICATION:
Because dip tanks contain chemicals that are harmful to boiler water, condensate is not returned. This project recovers the heat from the waste condensate to be used to heat the building interior.

19. SAVINGS DISPOSITION:
Savings are used to reduce energy expenditures

20. OTHER REMARKS (Continue on page 5, if more space is needed)

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

21a. SUMMARY OF DOLLAR SAVINGS
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY *(Identify)* #6 Fuel Oil	33,800	29,700	29,700	29,700	29,700	4,100	4,100	4,100	4,100
CONTRACT COSTS									
OTHER *(Identify)* _____									
TOTALS	33,800	29,700	29,700	29,700	29,700	4,100	4,100	4,100	4,100

b. PRIORITIZATION

(1) INTERNAL RATE OF RETURN *(IRR)*

Divide estimated project cost 2,703 by average annual savings 4,100 = 0.66 factor.

Based on factor and number of years economic life of the project, select the IRR from Table H-3, App H, Ch. 5, AR 5-4 = 300 % IRR.

(2) SAVINGS TO INVESTMENT RATIO *(S/I)*

Multiply annual savings 4,100 X discount factor 9,524 = 39,000 and divide by present value of investment *(undiscounted)* 2,703 = 14.4 S/I.

(Based on economic life 25 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) RATE OF INVESTMENT PER MANPOWER SPACE *(RIMS)* N/A

Divide estimated project cost _____ by number of manpower space savings _____ = _____ RIMS.

(Manpower requirements cannot be used in this computation.)

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)—Continued.

22. COST FOR PROJECT TO BECOME OPERATIONAL

EQUIPMENT TYPE a	PROPOSED SOURCE OF PROCUREMENT b	UNIT PRICE c	QUANTITY d	TOTAL COST e	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT f	FY FUNDS REQUIRED g
(1) Hydronic heaters	-	$901	3	$2,703		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION (Equipment delivery)						
(7) EQUIPMENT MODIFICATION[1]						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT[2]						
(10) FACILITIES MODIFICATION[3]						
(11) TRAINING						
(12) OTHER (Specify):						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL[4]				$2,703		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				$2,703		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE[5]				-		
(16) TOTAL (Sum of (14) + (15) above)				$2,703		

[1] *Not to exceed 10% of equipment cost for QRIP projects.*

[2] *Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.*

[3] *Normally not OPA funded.*

[4] *Used to compute amortization in Item 11.*

[5] *Specify source to include certification that funds are available, if financed from the regular budget:*

Page 3 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

23. SUMMARY OF SAVINGS *(MANPOWER AND DOLLARS)*										
ITEMS	SAVINGS			REAPPLICATION OF SAVINGS						
	NO. MPR OR MHR	TYPE PERS[6]	DOLLARS	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
				e. FROM	f. TO	g. FROM	h. TO	i. FROM	j. TO
a	b	c	d						
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS[7]									
(7) OTHER DOLLAR SAVINGS *(Excluding Manpower)*, e.g., CONTRACT COSTS & UTILITIES									
(8) #6 Fuel Oil			$4,100						
(9)									
(10)									
(11) TOTAL DOLLAR SAVINGS			$4,100						

[6] *(1) US Graded*
(2) US Wage Board
(3) DHFN
(4) IHFN
(5) Officer
(6) WO
(7) Enlisted

[7] *Reflect specific duties being performed with additional manhours available (equivalent manyears)*

Page 4 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

24. REGULATORY APPROVAL/COORDINATION		
a. INVESTMENT STATEMENT This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints. (Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)		
b. OTHER COORDINATION (Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)		
25. SUBMITTED BY (Typed name, grade and title of Subordinate Command/Agency or Project Initiator)	SIGNATURE	DATE (YYMMDD) AUTOVON
26. APPROVAL RECOMMENDED BY (MACOM/Agency)	SIGNATURE	DATE (YYMMDD) AUTOVON
FOR USE BY HQDA ON OSD PIF PROJECTS ONLY		
27. APPROVED BY	SIGNATURE	DATE (YYMMDD) AUTOVON
28. OTHER REMARKS (Cont'd)		

Page 5 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

ECO Number: 6

CONDENSATE HEAT RECOVERY FOR BOILERS IN BUILDING 349

Discussion

This ECO identifies known steam and condensate losses, assesses their recoverability and evaluates their economic impact.

Steam losses for deaerator heating, atomizing steam, soot blowing and steam cleaning are all vented directly or indirectly to the atmosphere. Condensate losses from dip tank heating may be contaminated by chemicals used in various processes and water losses from boiler blowdown are "dirty" and unsuitable for return. One energy savings option is to recover the heat from the various streams.

The heat in the boiler blowdown can be recovered for boiler makeup. The heat in the dip tank condensate can be used to heat building air during the heating season. Both of these options are evaluated in this ECO.

Recommendations

Based on the Life Cycle Cost Analysis, heat recovery from the boiler blowdown is not recommended. However, heat recovery from dip tank condensate in Buildings 350N, 350S and 370 are recommended.

Construction Cost	$2,423
Annual Energy Savings (MBtu/yr)	
No. 6 Fuel Oil	938
Annual Energy Cost Savings ($/yr)	$4,100
SIR	38.6
Simple Payback (years)	0.7

LIFE CYCLE COST ANALYSIS SUMMARY — STUDY: ECO6
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) — LCCID 1.062
INSTALLATION & LOCATION: LETTERKENNY ADREGION NOS. 3 CENSUS: 1
PROJECT NO. & TITLE: ECO #6 HEAT RECOVERY FROM CONDENSATE
FISCAL YEAR 1992 DISCRETE PORTION NAME: TOTAL PROJECT
ANALYSIS DATE: 10-14-91 ECONOMIC LIFE 25 YEARS PREPARED BY: G. FALLON

1. INVESTMENT

A. CONSTRUCTION COST	$ 2423.
B. SIOH	$ 134.
C. DESIGN COST	$ 146.
D. SALVAGE VALUE COST	-$ 0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	$ 2703.

2. ENERGY SAVINGS (+) / COST (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	$ 10.94	0.	$ 0.	15.11	0.
B. DIST	$ 4.98	0.	$ 0.	21.31	0.
C. RESID	$ 4.41	938.	$ 4137.	25.22	104325.
D. NAT G	$ .00	0.	$ 0.	20.70	0.
E. COAL	$ .00	0.	$ 0.	15.93	0.
F. TOTAL		938.	$ 4137.		$ 104325.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)		$ 0.
(1) DISCOUNT FACTOR (TABLE A)	14.53	
(2) DISCOUNTED SAVING/COST (3A X 3A1)		$ 0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)		$ 0.

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 34427.
A IF 3D1 IS = OR > 3C GO TO ITEM 4
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)_____
C IF 3D1B IS = > 1 GO TO ITEM 4
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YRS ECONOMIC LIFE)) $ 4137.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 104325.

6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 38.60
(IF < 1 PROJECT DOES NOT QUALIFY)

7. SIMPLE PAYBACK PERIOD (ESTIMATED) SPB=1F/4 .65

RS&H

SUBJECT LETTERKENNY A.D. ECO #6

AEP NO 290-0379-001

SHEET _____ OF _____

DESIGNER G.F.

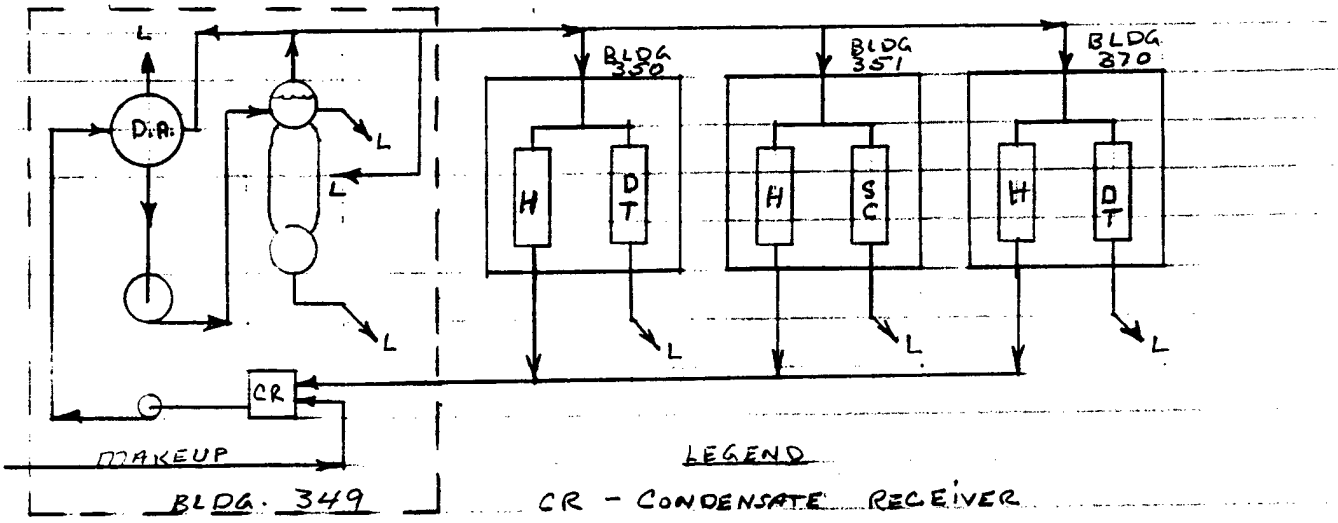
DATE _____

CHECKER [illegible]

DATE _____

ECO#6 – REDUCE MAKEUP WATER REQUIREMENTS AT BLDG. 349

PROCESS FLOW DIAGRAM - MAIN BOILER (#349)



LEGEND

CR - CONDENSATE RECEIVER
DA - DEAERATING FEEDWATER HEATER
DT - DIP TANK HEATING
H - COMFORT HEATING
L - LOSS
SC - STEAM CLEANING.

	STEAM LOSSES	HEAT RECOVERABLE	CONDENSATE RECOVERABLE
1.	D. A. VENT	NO	NO
2.	CONTINUOUS BLOWDOWN	YES	NO
3.	BOTTOM BLOWDOWN	YES	NO
4.	SOOT BLOWER	NO	NO
5.	ATOM. STEAM	NO	NO
6.	BLDG 350 DIPTANKS	YES	NO
7.	BLDG 351 STEAM CLEAN	NO	NO
8.	BLDG 370 DIP TANKS	YES	NO

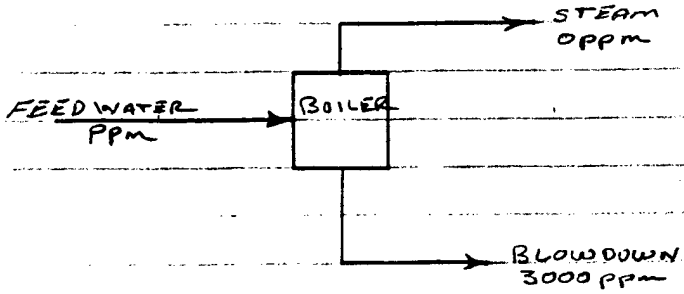
RS&H

SUBJECT LETTER KENNY A.D. ECO #6 | AEP NO | SHEET 2 OF | DESIGNER | DATE | CHECKER | DATE

HEAT RECOVERY FROM BOILER BLOWDOWN (Items 2 & 3)

DETERMINE BLOWDOWN FLOW

ASSUME: 3000 ppm TDS BOILER WATER (ABMA STD)
: 30 ppm IN FEEDWATER



Σ water = 0 = FEEDWATER − STEAM FLOW − BLOW DOWN = $m_f - m_s - m_B$

Σ SOLIDS = 0 = FEEDWATER X CONC. − STEAM FLOW X CONC. − BLOWDOWN X CONC

$$0 = m_f \times C_f - m_s C_s - m_B C_B$$

$$0 = m_f C_f - (m_f - m_B) C_s - m_B C_B \quad (C_s \approx 0)$$

$$0 = m_f C_f - m_B C_B$$

$$m_B = m_f \frac{C_f}{C_B} = m_f \frac{30}{3000} = .001\, m_f$$

SO BLOWDOWN ≈ .1% of STEAM FLOW

TOTAL STEAM PRODUCTION

$$\text{TOTAL STEAM PRODUCTION} = \frac{\text{TOTAL FUEL CONSUMPTION}}{\text{BOILER EFF} \times \Delta H}$$

$$= \frac{188\,578 \text{ MBTU/yr}}{.8 \times (1188.1 - (.8 \times 148 + .2 \times 28))}$$

$$= 221.5 \text{ MILLION LBS STEAM/yr.}$$

TOTAL BLOW DOWN

$$221.5 \times 10^6 \times .001 = 221.5 \times 10^3 \text{ LBS/yr.}$$

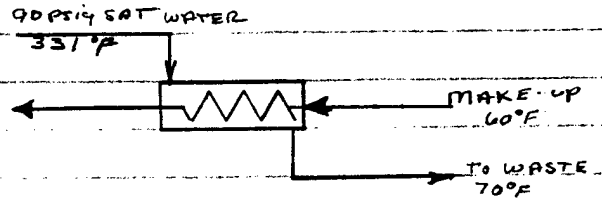
RS&H

SUBJECT LEAD
ECO #6

AEP NO
SHEET OF
DESIGNER
DATE
CHECKER
DATE

RECOVERABLE ENERGY IN BLOW DOWN

ASSUME: 10° ΔT COLD END APPROACH
90 psig BOILER PRESSURE
MAKE-UP WATER TEMP = 60°F



$$\dot{Q} = \dot{w} c_p \Delta T = \frac{221.5 \times 10^3 \text{ LBS/yr} \times (331 - 70)}{0.8 \times 10^6} = 72.3 \text{ MBTU/yr}$$

#601C

VALUE OF RECOVERED ENERGY

72.3 MBTU/yr × $6.61/MBTU = $478./yr.

CONSTRUCTION COST = $9297

PAYBACK = $9297 / $478/yr = 19.4 YEARS => NOT RECOMMENDED

RS-H

SUBJECT LEAD ECO #6 | AEP NO | SHEET | OF | DESIGNER | DATE | CHECKER | DATE

HEAT RECOVERY FROM DIP TANK CONDENSATE.

DIP TANK STEAM CONSUMPTION

DURING NON-WORK SUMMERTIME WEEKENDS THE ONLY STEAM CONSUMERS ARE THE DIP TANKS IN BUILDINGS 350 & 370. SINCE THESE ARE THE ONLY CONSUMERS AND THE CONDENSATE IS DUMPED, THE MAKEUP FLOW IS EQUAL TO THE STEAM FLOW AND THE CONDENSATE FLOW.

1990 AUGUST WEEKEND MAKEUP FLOW DATA

DATE	MAK-UP FLOW (GPD)
4	2891
5	2800
11	2800
12	2800
18	3200
19	3300
25	4000
26	3300
TOTAL	25100
AVERAGE (GPD)	3140
AVERAGE (#/HR)	1090

THERE ARE 11 HEATED TANKS TOTALING 19,200 GAL. THE TANKS OPERATE AT APPROXIMATELY THE SAME TEMPERATURE. THE STEAM CAN BE ASSUMED TO BE CONSUMMED AS A FUNCTION OF TANK CAPACITY. THE CONDENSATE TEMPERATURE IS EQUAL TO THE TANK TEMPERATURE

$$\frac{1090\ \#/HR}{19200\ gal} = 0.0568\ \#\ STEAM/HR/gal$$

RS&H

SUBJECT LEAD ECO #6 | AEP NO
SHEET OF
DESIGNER | DATE
CHECKER | DATE

350 N

4 TANKS @ 3000 gal ea = 12,000 gal
2 TANKS @ 500 gal ea = 1,000 gal
13,000 gal

TOTAL STEAM CONSUMPTION

13,000 gal X 0.0568 # STEAM/HR/gal = 738 LBS STM/HR.

RECOVERABLE ENERGY IN CONDENSATE

ASSUME: 68°F INDOOR TEMP., 10° H/X APPROACH.
738 LBS. STM/HR X (180 − 78) = 75,300 BTU/HR

ANNUAL HEAT RECOVERY

$\frac{75300 \text{ BTU/HR}}{10^6 \text{ BTU/MBTU} \times 0.8} \times 6687 \text{ HR/YR} = 629 \text{ MBTU/YR}$ #6 OIL

RS&H

SUBJECT LEAD
ECO #6
DESIGNER
CHECKER

AEP NO
SHEET OF
DATE
DATE

350 S

2 TANKS @ 1600 gal ea = 3200 gal

TOTAL STEAM CONSUMPTION

3200 gal x 0.0568 #STM/HR/gal = 182 LBS STM/HR

RECOVERABLE ENERGY IN CONDENSATE

182 LBS STM/HR x (180-78) = 18500 BTU/HR

ANNUAL HEAT SAVED

$\frac{18500 \text{ BTU/HR}}{10^6 \text{ BTU/MBTU} \times 0.8} \times 6687 \text{ HRS/YR} = 155 \text{ MBTU/YR}$ #6 OIL

RS&H

SUBJECT LEAD ECO #6 | AEP NO
SHEET OF
DESIGNER | DATE
CHECKER | DATE

370

3 TANKS @ 1000 gal @ = 3000 gal

TOTAL STEAM CONSUMPTION

3000 gal X 0.0568 #S/HR·gal = 170 LBS STM/HR

RECOVERABLE ENERGY IN CONDENSATE

170 LBS STM/HR X (180 − 72) = 18400 BTU/HR

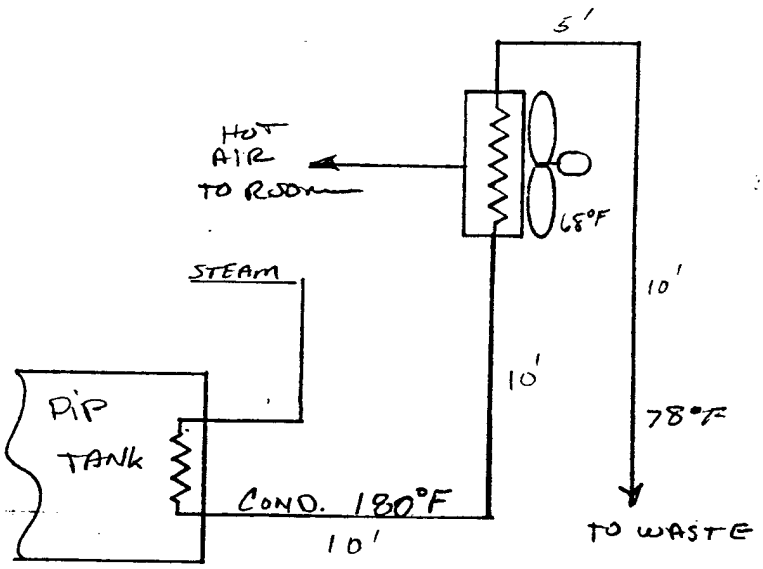
ANNUAL ENERGY RECOVERY

$\frac{18400\ BTU/HR}{10^6\ BTU/MMBTU \times 0.8} \times 6687\ HRS/YR = 154\ \frac{MBTU}{YR}$ #601

RS•H®

SUBJECT LEAD* ECO #6 | AEP NO
SHEET OF
DESIGNER | DATE
CHECKER | DATE

DIP TANK CONDENSATE HEAT RECOVERY



1 HYDRONIC HEATER
35 ft-1" ø SCH 40 PIPE.
3 1" ø " " ELS.
NO INSULATION!

ONE UNIT REQUIRED @ EACH GROUP of DIP TANKS, 3 TOTAL.

TOTAL ENERGY SAVED = .429 + 155 + 154 = 938 MBTU/yr

TOTAL CONSTRUCTION COST $2701

QRIP Calculations

Present energy use = {(738 + 182 + 170) #/hr} * 6687 hr/yr * 1050 Btu/lb

= 7653 MBtu/yr * 4.41 #/MBtu = $33,800/yr

LETTERKENNY ARMY DEPOT ENERGY AUDIT OF INDUSTRIAL FACILITIES

Operation Hrs/Day = 24

Room or Supply Air Conditions - Winter		68
Air Quantity (cfm)		1
Hour Fractions	1 AM - 9 AM	1
	9 AM - 5 PM	1
	5 PM - 1 AM	1
Operation Days Per Week		5

Temp. Range		Hours of Occurrence 2-9	10-17	18-1	Total Hours	Delta H or T	Const.	CFM	BTU/HR	Total BTU
70	74	247	237	301	785	-4	1.08	1	0	0
65	69	296	217	278	791	1	1.08	1	1	854
60	64	269	196	236	701	6	1.08	1	6	4,542
55	59	249	191	209	649	11	1.08	1	12	7,710
50	54	221	193	202	616	16	1.08	1	17	10,644
45	49	218	193	206	617	21	1.08	1	23	13,994
40	44	237	236	239	712	26	1.08	1	28	19,993
35	39	289	246	286	821	31	1.08	1	33	27,487
30	34	304	194	258	756	36	1.08	1	39	29,393
25	29	184	106	152	442	41	1.08	1	44	19,572
20	24	124	65	90	279	46	1.08	1	50	13,861
15	19	75	32	57	164	51	1.08	1	55	9,033
10	14	54	13	26	93	56	1.08	1	60	5,625
5	9	18	3	9	30	61	1.08	1	66	1,976
0	4	9	0	2	11	66	1.08	1	71	784
-5	-1	3	0	1	4	71	1.08	1	77	307
-10	-6	1	0	0	1	76	1.08	1	82	82
-15	-11	0	0	0	0	81	1.08	1	87	0
Totals		2798	2122	2552	7472					165,858

Total Operation Hours While Heating (and corrected for working days/week)	4776	118,470
Avg outdoor temp while heating (F)	45.0	

7472
− 785
6687 HRS of HEATING

05/16/91

ECO Construction Cost Estimate
Calculations

ECO Name: Condensate heat recovery - dip tank heat exchanger

ECO #: 6

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$1,310
Labor	$274
Subtotal bare costs	$1,584
FICA Insurance (20% of Labor)	$55
Sales Tax (6.5% of Material)	$85
Subtotal	$1,724
Overhead (15%)	$259
Subtotal	$1,983
Profit (10%)	$198
Subtotal	$2,181
Bond (1%)	$22
Subtotal	$2,203
Contingency (10%)	$220
Subtotal (Construction Cost Input For LCCID *)	$2,423
SIOH (5.5% of Construction Cost)	$133
Subtotal	$2,556
Design (6% of Construction Cost)	$145
Total Project Cost	$2,701

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE	DATE PREPARED	SHEET OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION:

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE
- ☐ CODE A (No design completed)
- ☒ CODE B (Preliminary design)
- ☐ CODE C (Final design)
- ☐ OTHER (Specify)

DRAWING NO.:

ESTIMATOR: G. Fallon

CHECKED BY: P. Hutchins

DIP TANK COND HEAT RECOV. ECO #6 SUMMARY

	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
1 HYDRONIC HEATER							
MEANS NO. 155630 4000	3	EA	31	93	415	1250	1340
1" SCH 40 PIPE	35	LF	3.84	134	1.49	52	186
1" " " ELS	3	EA	15.65	47	1.30	4	51
				274		1310	1580

ENG FORM 150
1 AUG 59

(ER 1110-345-730)

PREVIOUS EDITION MAY BE USED

(TRANSLUCENT)

05/16/91

ECO Construction Cost Estimate
Calculations

ECO Name: Condensate heat recovery - blow down heat exchanger

ECO #: 6

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$3,340
Labor	$1,980
Subtotal bare costs	$5,320
FICA Insurance (20% of Labor)	$396
Sales Tax (6.5% of Material)	$217
Subtotal	$5,933
Overhead (15%)	$890
Subtotal	$6,823
Profit (10%)	$682
Subtotal	$7,505
Bond (1%)	$75
Subtotal	$7,580
Contingency (10%)	$758
Subtotal (Construction Cost Input For LCCID *)	$8,338
SIOH (5.5% of Construction Cost)	$459
Subtotal	$8,797
Design (6% of Construction Cost)	$500
Total Project Cost	$9,297

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE

DATE PREPARED | SHEET OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION:

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE
- ☐ CODE A (No design completed)
- ☒ CODE B (Preliminary design)
- ☐ CODE C (Final design)
- ☐ OTHER (Specify)

DRAWING NO.

ESTIMATOR: G. Fallon

CHECKED BY: P. Hutchins

BLOWDOWN HEAT RECOVERY - ECO 6 SUMMARY

	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
BLOW DOWN HEAT H/X							
MEANS ITEM NO							
155601180	1	ea	185	185	2160	2160	2350
2" ø SCH 40 PIPE	200	LF	5.75	1150	2.91	582	1730
2" ø CAL. SIL INSULATION	200	LF	2.22	444	2.22	444	890
2" ø STEEL ELS.	10	EA	20	200	15.7	157	360
				1980		3340	5330

ENG FORM 150
1 AUG 59

(ER 1110-345-730))

PREVIOUS EDITION MAY BE USED

(TRANSLUCENT)

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS
For use of this form, see AR 5-4; the proponent agency is OCA.

1. PROJECT NO.: AMC QRIP

REQUIREMENT CONTROL SYMBOL DD-M(R) 1561

2. TO:
HQ DA
Attn: DACS-DME
Pentagon
Washington, DC 20310-2070

3. THRU:
US AMC
Attn: AMCMM-M
5001 Eisenhower Ave
Alexandria, VA 22303-0001

4. FROM:
Commander
US DESCOM
Attn: AMSDS-RM-P
Chambersburg, PA 17201-4170

5. DOD COMP NAME: Army

6. DOD COMP CODE: A

7. COMMAND CODE: W73QKK

8. DATE: 10/9/91

9. PROJECT TITLE: Paint Booth Exhaust Fan Controls

10. TYPE OF PROJECT (Check one): [X] QRIP [ ] OSD PIF [ ] PECIP

11. AMORTIZATION YEARS/MONTHS: $ 5,135 (Project Cost) ÷ $23,000 (Average Annual Savings) X 12 (No. Mos) = 0.2 (years) or – (months) (amortization)

12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR: 024

13. ECONOMIC LIFE: 15

14. EXPECTED OPERATIONAL DATE:

15. SUBMITTING UNIT(S):
Commander
Letterkenny Army Depot
Attn: SDSLE-EM (T. Hagie)
Bldg. 663
Chambersburg, PA 17201-4150

16. UNIT ID CODE:

17. PROJECT DESCRIPTION:
This project provides controls for nine paint booths that will allow exhaust air use only when occupied.

18. DETAILED JUSTIFICATION:
For convenience, paint booth exhaust fans are left on continuously during work shifts. This project shuts off the exhaust fan when unoccupied and saves energy.

19. SAVINGS DISPOSITION:
Savings are used to reduce energy expenditures

20. OTHER REMARKS (Continue on page 6, if more space is needed)

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

21a. SUMMARY OF DOLLAR SAVINGS
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY *(Identify)* Elec. & #6 Fuel Oil	45,800	24,200	24,200	24,200	24,200	21,600	21,600	21,600	21,600
CONTRACT COSTS									
OTHER *(Identify)* _____									
TOTALS	45,800	24,200	24,200	24,200	24,200	21,600	21,600	21,600	21,600

b. PRIORITIZATION

(1) INTERNAL RATE OF RETURN *(IRR)*

Divide estimated project cost 5,135 by average annual savings 23,000 = 0.2 factor.

Based on factor and number of years economic life of the project, select the IRR from Table H-3, App H, Ch. 5, AR 5-4 = 300+ % IRR.

(2) SAVINGS TO INVESTMENT RATIO *(S/I)*

Multiply annual savings 23,000 X discount factor 7.98 = $183,500 and divide by present value of investment *(undiscounted)* 5,135 = 33.6 S/I.

(Based on economic life 15 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) RATE OF INVESTMENT PER MANPOWER SPACE *(RIMS)* N/A

Divide estimated project cost _____ by number of manpower space savings _____ = _____ RIMS.

(Manpower requirements cannot be used in this computation.)

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)—Continued.

22. COST FOR PROJECT TO BECOME OPERATIONAL

EQUIPMENT TYPE a	PROPOSED SOURCE OF PROCUREMENT b	UNIT PRICE c	QUANTITY d	TOTAL COST e	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT f	FY FUNDS REQUIRED g
(1) Occupancy Sensor		$571	9	$5,135		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION *(Equipment delivery)*						
(7) EQUIPMENT MODIFICATION[1]						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT[2]						
(10) FACILITIES MODIFICATION[3]						
(11) TRAINING						
(12) OTHER *(Specify)*:						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL[4]				$5,135		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				$5,135		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE[5]				-		
(16) TOTAL *(Sum of (14) + (15) above)*				$5,135		

[1] *Not to exceed 10% of equipment cost for QRIP projects.*

[2] *Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.*

[3] *Normally not OPA funded.*

[4] *Used to compute amortization in Item 11.*

[5] *Specify source to include certification that funds are available, if financed from the regular budget:*

Page 3 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

23. SUMMARY OF SAVINGS *(MANPOWER AND DOLLARS)*

ITEMS	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR	TYPE PERS[6]	DOLLARS	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
a	b	c	d	e. FROM	f. TO	g. FROM	h. TO	i. FROM	j. TO
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS[7]									
(7) OTHER DOLLAR SAVINGS *(Excluding Manpower)*, e.g., CONTRACT COSTS & UTILITIES									
(8) Electricity			$1,400						
(9) #6 Fuel Oil			$21,600						
(10)									
(11) TOTAL DOLLAR SAVINGS			$23,000						

6 *(1) US Graded*
(2) US Wage Board
(3) DHFN
(4) IHFN
(5) Officer
(6) WO
(7) Enlisted

[7] *Reflect specific duties being performed with additional manhours available (equivalent manyears)*

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

24. REGULATORY APPROVAL/COORDINATION		
a. INVESTMENT STATEMENT This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints. *(Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)*		
b. OTHER COORDINATION *(Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)*		
25. SUBMITTED BY *(Typed name, grade and title of Subordinate Command/Agency or Project Initiator)*	SIGNATURE	DATE *(YYMMDD)* AUTOVON
26. APPROVAL RECOMMENDED BY *(MACOM/Agency)*	SIGNATURE	DATE *(YYMMDD)* AUTOVON
FOR USE BY HQDA ON OSD PIF PROJECTS ONLY		
27. APPROVED BY	SIGNATURE	DATE *(YYMMDD)* AUTOVON
28. OTHER REMARKS *(Cont'd)*		

Page 5 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

LIFE CYCLE COST ANALYSIS SUMMARY — STUDY: ECO9
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) — LCCID 1.062
INSTALLATION & LOCATION: LETTERKENNY ADREGION NOS. 3 CENSUS: 1
PROJECT NO. & TITLE: ECO #9 PAINT BOOTH FAN CONTROLS
FISCAL YEAR 1992 DISCRETE PORTION NAME: TOTAL PROJECT
ANALYSIS DATE: 10-14-91 ECONOMIC LIFE 15 YEARS PREPARED BY: G. FALLON

1. INVESTMENT

A. CONSTRUCTION COST	$ 4604.
B. SIOH	$ 254.
C. DESIGN COST	$ 277.
D. SALVAGE VALUE COST	-$ 0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	$ 5135.

2. ENERGY SAVINGS (+) / COST (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	$ 10.94	124.	$ 1357.	10.75	14583.
B. DIST	$ 4.98	0.	$ 0.	14.08	0.
C. RESID	$ 4.41	4895.	$ 21587.	16.21	349924.
D. NAT G	$ .00	0.	$ 0.	13.25	0.
E. COAL	$ .00	0.	$ 0.	11.13	0.
F. TOTAL		5019.	$ 22944.		$ 364507.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)		$ 0.
(1) DISCOUNT FACTOR (TABLE A)	10.59	
(2) DISCOUNTED SAVING/COST (3A X 3A1)		$ 0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)		$ 0.

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 120287.
A IF 3D1 IS = OR > 3C GO TO ITEM 4
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)_____
C IF 3D1B IS = > 1 GO TO ITEM 4
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YRS ECONOMIC LIFE)) $ 22944.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 364507.

6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 70.98
(IF < 1 PROJECT DOES NOT QUALIFY)

7. SIMPLE PAYBACK PERIOD (ESTIMATED) SPB=1F/4 .22

ECO Number: 9

PAINT BOOTH FAN CONTROL

Discussion

Paint booth exhaust fans operate continuously during the shift when painting is to be done. However, the fan is required to operate only when paint is being applied.

This ECO provides controls for nine paint booths that will turn the fan off if no one has been in the paint booth for three minutes, and will turn it on whenever any one enters the booth.

Recommendations

Based on the Life Cycle Cost Analysis, this project is recommended.

Construction Cost	$4,604
Annual Energy Savings (MBtu/yr)	
No. 6 Oil	4,895
Electricity	124
Annual Energy Cost Savings ($/yr)	$22,900
SIR	71.0
Simple Payback (years)	0.2

RS&H

SUBJECT LETTERKENNY A.D. AEP NO 290-0379-001
ECO 9 SHEET 1 OF
DESIGNER G. F. DATE
CHECKER DATE

ECO # 9 Paint Booth Fan Control : Bldg 350, Booth #61

CURRENT ENERGY COSTS

NO. 6 OIL

ASSUME: 68°F EXHAUST AIR, 2 SHIFT OPERATION
74,233 BTU/CFM/YR.
12141 CFM EXHAUST FLOW
BOILER EFFICIENCY = 0.8

HEAT LOSS F491 Fuel prices except for Q

$$HL = \frac{74{,}233\ B/CFM/yR \times 12141\ CFM}{0.8 \times 10^6} = 1127\ MBTU/yR$$

HEAT LOSS COST

$1130\ MBTU/yR \times \$4.41/MBTU = \$4983/yR$

ELECTRICITY

ASSUME: 2 HP MOTOR (BKA, INC. REPORT)

ENERGY CONSUMED

$2\ HP \times .746\ KW/HP \times 16H/d \times 5\text{-}d/w \times 52\ w/yR = 6210\ KWH$
$= 21.\ \frac{MBTU}{yR}$

COST

$6210\ KWH \times \$0.0373/KWH = \$230/yR$

TOTAL COST

$\$4983/yR + \$230/yR = \$5213/yR$

SAVINGS

ASSUME: FAN IS OFF FOR 1/2 TIME.

RS&H

SUBJECT LEAD ECO #9 AEP NO

SHEET 2 OF

DESIGNER DATE

CHECKER DATE

SAVINGS CONT.

No. 6 OIL

ENERGY

$\frac{1127 \text{ MBTU/YR}}{2} = 564 \text{ MBTU/YR}$

COST

$564 \text{ MBTU/YR} \times \$4.41/\text{MBtu} = \$2487/\text{YR}$

ELECTRICITY

ENERGY

$\frac{6210 \text{ kWh/yr}}{2} = 3110 \text{ kWh/yr} = 11 \text{ MBTU/YR}$

COST

$3110 \text{ kWh/yr} \times \$0.0373/\text{kWh} = \$120/\text{yr}.$

TOTAL SAVINGS

COST SAVINGS = OIL SAVINGS + ELEC. SAVINGS

$= \$2487/\text{YR} + \$120/\text{YR}$

$= \$2607/\text{YR}$

ENERGY SAVINGS = $564 \frac{\text{MBtu}}{\text{Yr}} + 11 \frac{\text{MBtu}}{\text{Yr}}$

$= 575 \text{ MBtu/yr}$

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number:	350
Paint Booth No.:	2527
Heating Fuel Type:	#6 Fuel Oil
Heating Fuel Cost:	$4.41 /MBtu
Boiler Efficiency:	80%
Electricity Cost:	$10.94 /MBtu
Exhaust Fan Motor:	5 HP
Exhaust Air Flow:	25,959 CFM
Makeup Percentage:	100%
Exhaust Air Temp.:	68 °F
O A Heating Load:	74,233 Btu/cfm-Yr
Operating Shifts:	2 /Day
Operating Days:	5 /Week

Current Energy Use:

Current Heating Energy =	2409 MBtu/Yr
Heating Energy Cost =	$10,624 /Yr
Current Electric Use =	53 MBtu/Yr
Electricity Cost =	$580 /Yr
Current Energy Use =	2462 MBtu/Yr
Current Energy Cost =	$11,204 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	1205 MBtu/Yr
Heating Cost Savings =	$5,314 /Yr
Electric Energy Savings =	27 MBtu/Yr
Electric Cost Savings =	$295 /Yr
Total Energy Savings =	1232 MBtu/Yr
Total Energy Cost Savings =	$5,609 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number:	37
Paint Booth No.:	280
Heating Fuel Type:	#6 Fuel Oil
Heating Fuel Cost:	$4.41 /MBtu
Boiler Efficiency:	80%
Electricity Cost:	$10.94 /MBtu
Exhaust Fan Motor:	3 HP
Exhaust Air Flow:	18,318 CFM
Makeup Percentage:	100%
Exhaust Air Temp.:	68 °F
O A Heating Load:	74,233 Btu/cfm-Yr
Operating Shifts:	2 /Day
Operating Days:	5 /Week

Current Energy Use:

Current Heating Energy =	1700 MBtu/Yr
Heating Energy Cost =	$7,497 /Yr
Current Electric Use =	32 MBtu/Yr
Electricity Cost =	$350 /Yr
Current Energy Use =	1732 MBtu/Yr
Current Energy Cost =	$7,847 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	850 MBtu/Yr
Heating Cost Savings =	$3,749 /Yr
Electric Energy Savings =	16 MBtu/Yr
Electric Cost Savings =	$175 /Yr
Total Energy Savings =	866 MBtu/Yr
Total Energy Cost Savings =	$3,924 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number:	37
Paint Booth No.:	468
Heating Fuel Type:	#6 Fuel Oil
Heating Fuel Cost:	$4.41 /MBtu
Boiler Efficiency:	80%
Electricity Cost:	$10.94 /MBtu
Exhaust Fan Motor:	2 HP
Exhaust Air Flow:	11,152 CFM
Makeup Percentage:	100%
Exhaust Air Temp.:	68 °F
O A Heating Load:	74,233 Btu/cfm-Yr
Operating Shifts:	2 /Day
Operating Days:	5 /Week

Current Energy Use:

Current Heating Energy =	1035 MBtu/Yr
Heating Energy Cost =	$4,564 /Yr
Current Electric Use =	21 MBtu/Yr
Electricity Cost =	$230 /Yr
Current Energy Use =	1056 MBtu/Yr
Current Energy Cost =	$4,794 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	518 MBtu/Yr
Heating Cost Savings =	$2,284 /Yr
Electric Energy Savings =	11 MBtu/Yr
Electric Cost Savings =	$120 /Yr
Total Energy Savings =	529 MBtu/Yr
Total Energy Cost Savings =	$2,404 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number:	37
Paint Booth No.:	470
Heating Fuel Type:	#6 Fuel Oil
Heating Fuel Cost:	$4.41 /MBtu
Boiler Efficiency:	80%
Electricity Cost:	$10.94 /MBtu
Exhaust Fan Motor:	3 HP
Exhaust Air Flow:	12,069 CFM
Makeup Percentage:	100%
Exhaust Air Temp.:	68 °F
O A Heating Load:	74,233 Btu/cfm-Yr
Operating Shifts:	2 /Day
Operating Days:	5 /Week

Current Energy Use:

Current Heating Energy =	1120 MBtu/Yr
Heating Energy Cost =	$4,939 /Yr
Current Electric Use =	32 MBtu/Yr
Electricity Cost =	$350 /Yr
Current Energy Use =	1152 MBtu/Yr
Current Energy Cost =	$5,289 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	560 MBtu/Yr
Heating Cost Savings =	$2,470 /Yr
Electric Energy Savings =	16 MBtu/Yr
Electric Cost Savings =	$175 /Yr
Total Energy Savings =	576 MBtu/Yr
Total Energy Cost Savings =	$2,645 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number:	370
Paint Booth No.:	200
Heating Fuel Type:	#6 Fuel Oil
Heating Fuel Cost:	$4.41 /MBtu
Boiler Efficiency:	80%
Electricity Cost:	$10.94 /MBtu
Exhaust Fan Motor:	5 HP
Exhaust Air Flow:	17,100 CFM
Makeup Percentage:	100%
Exhaust Air Temp.:	68 °F
O A Heating Load:	35,618 Btu/cfm-Yr
Operating Shifts:	1 /Day
Operating Days:	5 /Week

Current Energy Use:

Current Heating Energy =	761 MBtu/Yr
Heating Energy Cost =	$3,356 /Yr
Current Electric Use =	26 MBtu/Yr
Electricity Cost =	$284 /Yr
Current Energy Use =	787 MBtu/Yr
Current Energy Cost =	$3,640 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	381 MBtu/Yr
Heating Cost Savings =	$1,680 /Yr
Electric Energy Savings =	13 MBtu/Yr
Electric Cost Savings =	$142 /Yr
Total Energy Savings =	394 MBtu/Yr
Total Energy Cost Savings =	$1,822 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number:	370
Paint Booth No.:	412
Heating Fuel Type:	#6 Fuel Oil
Heating Fuel Cost:	$4.41 /MBtu
Boiler Efficiency:	80%
Electricity Cost:	$10.94 /MBtu
Exhaust Fan Motor:	1.5 HP
Exhaust Air Flow:	6,147 CFM
Makeup Percentage:	100%
Exhaust Air Temp.:	68 °F
O A Heating Load:	35,618 Btu/cfm-Yr
Operating Shifts:	1 /Day
Operating Days:	5 /Week

Current Energy Use:

Current Heating Energy =	274 MBtu/Yr
Heating Energy Cost =	$1,208 /Yr
Current Electric Use =	8 MBtu/Yr
Electricity Cost =	$88 /Yr
Current Energy Use =	282 MBtu/Yr
Current Energy Cost =	$1,296 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	137 MBtu/Yr
Heating Cost Savings =	$604 /Yr
Electric Energy Savings =	4 MBtu/Yr
Electric Cost Savings =	$44 /Yr
Total Energy Savings =	141 MBtu/Yr
Total Energy Cost Savings =	$648 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number:	370
Paint Booth No.:	3877
Heating Fuel Type:	#6 Fuel Oil
Heating Fuel Cost:	$4.41 /MBtu
Boiler Efficiency:	80%
Electricity Cost:	$10.94 /MBtu
Exhaust Fan Motor:	2 HP
Exhaust Air Flow:	11,956 CFM
Makeup Percentage:	100%
Exhaust Air Temp.:	68 °F
O A Heating Load:	35,618 Btu/cfm-Yr
Operating Shifts:	1 /Day
Operating Days:	5 /Week

Current Energy Use:

Current Heating Energy =	532 MBtu/Yr
Heating Energy Cost =	$2,346 /Yr
Current Electric Use =	11 MBtu/Yr
Electricity Cost =	$120 /Yr
Current Energy Use =	543 MBtu/Yr
Current Energy Cost =	$2,466 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	266 MBtu/Yr
Heating Cost Savings =	$1,173 /Yr
Electric Energy Savings =	6 MBtu/Yr
Electric Cost Savings =	$66 /Yr
Total Energy Savings =	272 MBtu/Yr
Total Energy Cost Savings =	$1,239 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number:	370
Paint Booth No.:	4298
Heating Fuel Type:	#6 Fuel Oil
Heating Fuel Cost:	$4.41 /MBtu
Boiler Efficiency:	80%
Electricity Cost:	$10.94 /MBtu
Exhaust Fan Motor:	7.5 HP
Exhaust Air Flow:	18,592 CFM
Makeup Percentage:	100%
Exhaust Air Temp.:	68 °F
O A Heating Load:	35,618 Btu/cfm-Yr
Operating Shifts:	1 /Day
Operating Days:	5 /Week

Current Energy Use:

Current Heating Energy =	828 MBtu/Yr
Heating Energy Cost =	$3,651 /Yr
Current Electric Use =	40 MBtu/Yr
Electricity Cost =	$438 /Yr
Current Energy Use =	868 MBtu/Yr
Current Energy Cost =	$4,089 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	414 MBtu/Yr
Heating Cost Savings =	$1,826 /Yr
Electric Energy Savings =	20 MBtu/Yr
Electric Cost Savings =	$219 /Yr
Total Energy Savings =	434 MBtu/Yr
Total Energy Cost Savings =	$2,045 /Yr

ECO #9 Project Summary
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/21/91

4.41 4.41 10.94

Building Number	Booth Number	Energy Savings (MBtu/Yr)				Energy Cost Savings ($/Yr)				CURRENT COSTS		
		#5 Oil	#6 Oil	Elect	Total	#5 Oil	#6 Oil	Elect	Total	FUEL OIL	ELEC.	TOTAL
350	61		564	11	575	$0	$2,487	$120	$2,608	$4,983	$230	$5,213
350	2527		1205	27	1232	$0	$5,314	$295	$5,609	$10,624	$580	$11,204
37	280	850		16	866	$3,749	$0	$175	$3,924	$7,497	$350	$7,847
37	468	518		11	529	$2,284	$0	$120	$2,405	$4,564	$230	$4,794
37	470	560		16	576	$2,470	$0	$175	$2,645	$4,939	$350	$5,289
370	200		381	13	394	$0	$1,680	$142	$1,822	$3,356	$284	$3,640
370	412		137	4	141	$0	$604	$44	$648	$1,208	$88	$1,296
370	3877		266	6	272	$0	$1,173	$66	$1,239	$2,346	$120	$2,466
370	4298		414	20	434	$0	$1,826	$219	$2,045	$3,651	$438	$4,089
Total Project		1928	2967	124	5019	$8,502	$13,084	$1,357	$22,944	$43,168	$2,670	$45,838

21,600

LETTERKENNY ARMY DEPOT ENERGY AUDIT OF INDUSTRIAL FACILITIES

Operation Hrs/Day = 8

Room or Supply Air Conditions - Winter		68
Air Quantity (cfm)		1
Hour Fractions	1 AM - 9 AM	0.25
	9 AM - 5 PM	0.75
	5 PM - 1 AM	0
Operation Days Per Week		5

Temp. Range		Hours of Occurrence 2-9	10-17	18-1	Total Hours	Delta H or T	Const.	CFM	BTU/HR	Total BTU
70	74	247	237	301	240	-4	1.08	1	0	0
65	69	236	217	278	237	1	1.08	1	1	256
60	64	269	196	236	214	6	1.08	1	6	1,388
55	59	249	191	209	206	11	1.08	1	12	2,441
50	54	221	193	202	200	16	1.08	1	17	3,456
45	49	218	193	206	199	21	1.08	1	23	4,519
40	44	237	236	239	236	26	1.08	1	28	6,634
35	39	289	246	286	257	31	1.08	1	33	8,596
30	34	304	194	258	222	36	1.08	1	39	8,612
25	29	184	106	152	126	41	1.08	1	44	5,557
20	24	124	65	90	80	46	1.08	1	50	3,962
15	19	75	32	57	43	51	1.08	1	55	2,355
10	14	54	13	26	23	56	1.08	1	60	1,406
5	9	18	3	9	7	61	1.08	1	66	445
0	4	9	0	2	2	66	1.08	1	71	160
-5	-1	3	0	1	1	71	1.08	1	77	58
-10	-6	1	0	0	0	76	1.08	1	82	21
-15	-11	0	0	0	0	81	1.08	1	87	0
Totals		2798	2122	2552	2291					49,865

Total Operation Hours While Heating (and corrected for working days/week)	1465	35,618
Avg outdoor temp while heating (F)	45.0	

ECO 9

LETTERKENNY ARMY DEPOT ENERGY AUDIT OF INDUSTRIAL FACILITIES

Operation Hrs/Day = 16

Room or Supply Air Conditions - Winter		68
Air Quantity (cfm)		1
Hour Fractions	1 AM - 9 AM	0.375
	9 AM - 5 PM	1
	5 PM - 1 AM	0.625
Operation Days Per Week		5

Temp. Range		Hours of Occurrence 2-9	10-17	18-1	Total Hours	Delta H or T	Const.	CFM	BTU/HR	Total BTU
70	74	247	237	301	518	-4	1.08	1	0	0
65	69	296	217	278	502	1	1.08	1	1	542
60	64	269	196	236	444	6	1.08	1	6	2,880
55	59	249	191	209	415	11	1.08	1	12	4,930
50	54	221	193	202	402	16	1.08	1	17	6,949
45	49	218	193	206	404	21	1.08	1	23	9,151
40	44	237	236	239	474	26	1.08	1	28	13,317
35	39	289	246	286	533	31	1.08	1	33	17,849
30	34	304	194	258	469	36	1.08	1	39	18,244
25	29	184	106	152	270	41	1.08	1	44	11,956
20	24	124	65	90	168	46	1.08	1	50	8,334
15	19	75	32	57	96	51	1.08	1	55	5,274
10	14	54	13	26	50	56	1.08	1	60	2,994
5	9	18	3	9	15	61	1.08	1	66	1,013
0	4	9	0	2	5	66	1.08	1	71	330
-5	-1	3	0	1	2	71	1.08	1	77	134
-10	-6	1	0	0	0	76	1.08	1	82	31
-15	-11	0	0	0	0	81	1.08	1	87	0
Totals		2798	2122	2552	4766					103,927

Total Operation Hours While Heating (and corrected for working days/week)	3035	74,233
Avg outdoor temp while heating (F)	45.0	

09/25/91

ECO Construction Cost Estimate Calculations

ECO Name: Walk-in Spray Booth Fan Control

ECO #: 9

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$1,179
Labor	$1,683
Subtotal bare costs	$2,862
FICA Insurance (20% of Labor)	$337
Sales Tax (6.5% of Material)	$77
Subtotal	$3,276
Overhead (15%)	$491
Subtotal	$3,767
Profit (10%)	$377
Subtotal	$4,144
Bond (1%)	$41
Subtotal	$4,185
Contingency (10%)	$419
Subtotal (Construction Cost Input For LCCID *)	$4,604
SIOH (5.5% of Construction Cost)	$253
Subtotal	$4,857
Design (6% of Construction Cost)	$276
Total Project Cost	$5,133

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE	DATE PREPARED	SHEET OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: Letterkenny Army Depot

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE
- ☐ CODE A (No design completed)
- ☒ CODE B (Preliminary design)
- ☐ CODE C (Final design)
- ☐ OTHER (Specify)

DRAWING NO.:

ESTIMATOR: G.F.

CHECKED BY: P. Hutchins

WALK-IN SPRAY BOOTH FAN CONTROL SUMMARY

	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
OCCUPANCY SENSOR	1	EA	25	25	80	80	105
CONDUIT ½" Ø	50	LF	2.97	149	.96	48	197
WIRE 2-14	0.5	KLF	2478	13	6.22	3	16
Subtotal For 1 Booth				187		131	318
x No. of Booths				x9		x9	
Total Bare Costs				$1,683		$1,179	$2862

ENG FORM 1 AUG 59 150 (ER 1110-345-730) PREVIOUS EDITION MAY BE USED (TRANSLUCENT)

* U.S. GOVERNMENT PRINTING OFFICE : 1990 O—616140

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS
For use of this form, see AR 5-4; the proponent agency is OCA.

1. PROJECT NO.: AMC QRIP

REQUIREMENT CONTROL SYMBOL DD-M(R) 1561

2. TO: HQ DA
Attn: DACS-DME
Pentagon
Washington, DC 20310-2070

3. THRU: US AMC
Attn: AMCMM-M
5001 Eisenhower Ave
Alexandria, VA 22303-0001

4. FROM: Commander
US DESCOM
Attn: AMSDS-RM-P
Chambersburg, PA 17201-4170

5. DOD COMP NAME: Army

6. DOD COMP CODE: A

7. COMMAND CODE: W73QKK

8. DATE: 10/9/91

9. PROJECT TITLE: Blast Booth Exhaust Fan Controls

10. TYPE OF PROJECT (Check one): [X] QRIP [ ] OSD PIF [ ] PECIP

11. AMORTIZATION YEARS/MONTHS: $ 7,280 (Project Cost) ÷ 17,613 (Average Annual Savings) X 12 (No. Mos) = 0.4 (years) or - (months) (amortization)

12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR: 024

13. ECONOMIC LIFE: 15

14. EXPECTED OPERATIONAL DATE:

15. SUBMITTING UNIT(S): Commander
Letterkenny Army Depot
Attn: SDSLE-EM (T. Hagie)
Bldg. 663
Chambersburg, PA 17201-4150

16. UNIT ID CODE:

17. PROJECT DESCRIPTION: Limit switches are used to allow blast booth exhaust fans to operate only when doors are closed.

18. DETAILED JUSTIFICATION: Currently, blast booth exhaust fans remain on continuously throughout the work shifts. This project will save energy by shutting down exhaust fans when booths are not in use.

19. SAVINGS DISPOSITION: Savings are used to reduce energy expenditures

20. OTHER REMARKS (Continue on page 5, if more space is needed)

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

21a. SUMMARY OF DOLLAR SAVINGS
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY *(Identify)* Electricity	$37,919	$20,306	$20,306	$20,306	$20,306	$17,613	$17,613	$17,613	$17,613
CONTRACT COSTS									
OTHER *(Identify)* _____									
TOTALS	$37,919	$20,306	$20,306	$20,306	$20,306	$17,613	$17,613	$17,613	$17,613

b. PRIORITIZATION

(1) INTERNAL RATE OF RETURN *(IRR)*

Divide estimated project cost 7,280 by average annual savings 17,613 = 0.4 factor.

Based on factor and number of years economic life of the project, select the IRR from Table H-3, App H, Ch. 5, AR 5-4 = 300+ % IRR.

(2) SAVINGS TO INVESTMENT RATIO *(S/I)*

Multiply annual savings 17,613 X discount factor 7.98 = 140,552 and divide by present value of investment *(undiscounted)* 7,280 = 19.3 S/I.

(Based on economic life 15 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) RATE OF INVESTMENT PER MANPOWER SPACE *(RIMS)* N/A

Divide estimated project cost _____ by number of manpower space savings _____ = _____ RIMS.

(Manpower requivalents cannot be used in this computation.)

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)—Continued.

22. COST FOR PROJECT TO BECOME OPERATIONAL

EQUIPMENT TYPE a	PROPOSED SOURCE OF PROCUREMENT b	UNIT PRICE c	QUANTITY d	TOTAL COST e	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT f	FY FUNDS REQUIRED g
(1) Limit Switches	-	$1,820	4	$7,280		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION (Equipment delivery)						
(7) EQUIPMENT MODIFICATION[1]						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT[2]						
(10) FACILITIES MODIFICATION[3]						
(11) TRAINING						
(12) OTHER (Specify):						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL[4]				$7,280		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				$7,280		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE[5]				-		
(16) TOTAL (Sum of (14) + (15) above)				$7,280		

[1] *Not to exceed 10% of equipment cost for QRIP projects.*

[2] *Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.*

[3] *Normally not OPA funded.*

[4] *Used to compute amortization in Item 11.*

[5] *Specify source to include certification that funds are available, if financed from the regular budget:*

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

23. SUMMARY OF SAVINGS *(MANPOWER AND DOLLARS)*

ITEMS	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR	TYPE PERS[6]	DOLLARS	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
a	b	c	d	e. FROM	f. TO	g. FROM	h. TO	i. FROM	j. TO
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS[7]									
(7) OTHER DOLLAR SAVINGS *(Excluding Manpower)*, e.g., CONTRACT COSTS & UTILITIES									
(8) Electricity			$17,613						
(9)									
(10)									
(11) TOTAL DOLLAR SAVINGS			$17,613						

[6] *(1) US Graded*
(2) US Wage Board
(3) DHFN
(4) IHFN
(5) Officer
(6) WO
(7) Enlisted

[7] *Reflect specific duties being performed with additional manhours available (equivalent manyears)*

Page 4 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

24. REGULATORY APPROVAL/COORDINATION		
a. INVESTMENT STATEMENT This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints. _____ *(Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)*		
b. OTHER COORDINATION *(Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)* _____ _____		
25. SUBMITTED BY *(Typed name, grade and title of Subordinate Command/Agency or Project Initiator)*	SIGNATURE	DATE *(YYMMDD)* AUTOVON
26. APPROVAL RECOMMENDED BY *(MACOM/Agency)*	SIGNATURE	DATE *(YYMMDD)* AUTOVON
FOR USE BY HQDA ON OSD PIF PROJECTS ONLY		
27. APPROVED BY	SIGNATURE	DATE *(YYMMDD)* AUTOVON
28. OTHER REMARKS *(Cont'd)*		

Page 5 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

ECO Number: 11

BLAST BOOT FAN SHUT-OFF (BUILDINGS 350 AND 37)

Discussion

The blast booth exhaust fan draws air from the building interior, circulates it through the booth and a bag house, and discharges it back into the building. This fan must be operated whenever blasting is under way. However, there is no reason for the fan to operate when the blast booth is not being utilized and the doors are open.

This ECO provides electrical equipment that will automatically stop the exhaust fan when the large booth doors are not fully closed. One limit switch mounted on each pair of doors will indicate the doors are closed and the fan may be started. The fan will operate until one of the large doors opens, or until the stop button is depressed.

Recommendations

Based on the Life Cycle Cost Analysis, this project is recommended.

Construction Cost	$6,529
Annual Energy Savings (MBtu/yr)	
Electricity	1,610
Annual Energy Cost Savings ($/yr)	$17,613
SIR	26.0
Simple Payback (years)	0.4

LIFE CYCLE COST ANALYSIS SUMMARY — STUDY: ECO11
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) — LCCID 1.062
INSTALLATION & LOCATION: LETTERKENNY ARREGION NOS. 3 CENSUS: 1
PROJECT NO. & TITLE: ECO #11 BLAST BOOTH FAN CONTROL (B350)
FISCAL YEAR 1991 DISCRETE PORTION NAME: TOTAL PROJECT
ANALYSIS DATE: 09-11-91 ECONOMIC LIFE 15 YEARS PREPARED BY: G. FALLON

1. INVESTMENT

A. CONSTRUCTION COST	$ 6529.
B. SIOH	$ 359.
C. DESIGN COST	$ 392.
D. SALVAGE VALUE COST	-$ 0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	$ 7280.

2. ENERGY SAVINGS (+) / COST (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	$ 10.94	1610.	$ 17613.	10.75	189344.
B. DIST	$ 7.43	0.	$ 0.	14.08	0.
C. RESID	$ 6.61	0.	$ 0.	16.21	0.
D. NAT G	$ .00	0.	$ 0.	13.25	0.
E. COAL	$ .00	0.	$ 0.	11.13	0.
F. TOTAL		1610.	$ 17613.		$ 189344.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)		$ 0.
(1) DISCOUNT FACTOR (TABLE A)	10.59	
(2) DISCOUNTED SAVING/COST (3A X 3A1)		$ 0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)		$ 0.

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 62484.
A IF 3D1 IS = OR > 3C GO TO ITEM 4
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)_____
C IF 3D1B IS = > 1 GO TO ITEM 4
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YRS ECONOMIC LIFE)) $ 17613.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 189344.

6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 26.01
(IF < 1 PROJECT DOES NOT QUALIFY)

7. SIMPLE PAYBACK PERIOD (ESTIMATED) SPB=1F/4 .41

RS&H®

SUBJECT LETTER KENNY A.D. ECO #11
AEP NO 290-0379-001
SHEET 1 OF 5
DESIGNER G.F.
DATE
CHECKER P. Hutchins
DATE

ECO #11

BLAST BOOTH FAN SHUT-OFF (BOOTH 49)

REF 1. LEAD, EEAP, RSH, 1981, VOL 2, PROJ-H, CALC. pg V-6

CURRENT ENERGY CONSUMPTION

ELECTRICITY

ASSUME: FLOW = 44,000 CFM (REF. 1)
ΔP DUCTWORK & BAGS = 5 IN.W.G.
η FAN & MOTOR = .6

$$\text{FAN HP} = \frac{\text{ACFM} \times \text{S.P.}}{6356 \times \eta} = \frac{44000 \times 5.0}{6356 \times .6} = 58 \text{ HP}$$

$$\text{KW} = .746 \times \text{HP} = 43 \text{ KW}$$

ENERGY CONSUMED

ASSUME: 3 SHIFT/day, 5d/wk

43 KW x 24 hr/d x 5 d/wk x 52 wk/yr = 268,000 kwhr./yr
916 mBTU/yr

COST OF ENERGY

916 mBTU/yr x $10.94/mBTU = $10,000/yr.

SAVINGS

ASSUME: BLASTING OCCURS FOR ON-1/2 TIME

ENERGY

916 mBTU/yr x .5 = 458 mBTU/yr (elec.)

COSTS

458 mBTU/yr x $10.94/mBTU = $5010/yr

RS&H®

SUBJECT LEAD ECO #11 AEP NO

SHEET 2 OF 5

DESIGNER DATE

CHECKER DATE

ECO - 11 (CONT)

BLAST BOOTH FAN SHUT-OFF (BOOTH 50)

REF 2: LEAD, EEAP, RSH, 1981. VOL 2, PROS-H, CALC. pg VI-1

CURRENT ENERGY CONSUMPTION

ASSUME: FLOW = 56,000 CFM (REF 2)

ΔP DUCT & BAGS = 5 IN. W.C.

η FAN & MOTOR = 0.6

$$\text{FAN HP} = \frac{\text{ACFM} \times \text{S.P.}}{6356 \times \eta} = \frac{56{,}000 \times 5}{6356 \times 0.6} = 73.4 \text{ HP}$$

$$\text{KW} = .746 \text{ KW/HP} \times \text{HP} = .746 \times 73.4 = 54.8 \text{ kw}$$

ENERGY CONSUMED

ASSUME 3 SHIFT/day, 5d/wk, 52wk/yr

$$54.8 \text{ kw} \times 24 \text{ H/d} \times 5 \text{d/wk} \times 52 \text{ wk/yr} = 342{,}000 \text{ kwh/yr.}$$

$$342{,}000 \text{ kw h/yr} \times \frac{3413 \text{ BTU/kwh}}{10^6 \text{ BTU/MBTU}} = 1170 \text{ MBTU/yr}$$

$1170 * 10.94 = \underline{\$12{,}800/\text{yr}}$

SAVINGS

ASSUME BLASTING OCCURS FOR 1/2 TIME

ENERGY

$1170 \text{ MBTU/yr} \times 0.5 = \underline{583} \text{ MBTU/yr (elec.)}$

COST

$583 \text{ MBTU/yr} \times \$10.94/\text{MBTU} = \$6380/\text{yr}$

RS&H®

SUBJECT LEAD ECO #11 AEP NO

SHEET 3 OF 5

DESIGNER DATE

CHECKER DATE

ECO -11 (CONT

BLAST BOOTH FAN SHUT-OFF (BOOTH 2544)

REF 3 : LEAD, FEAP, RSH, 1981, VOL. 2, PROJ- H, CALC. pg VII-1

CURRENT ENERGY CONSUMPTION

ASSUME: FLOW = 44,000 CFM (REF 3)

ΔP DUCT & BAGS = 5 IN. W.C.

η FAN & MOTOR = 0.6

VALUES ARE SAME AS BOOTH 49 (pg. 11-1) SO SAVINGS WILL BE THE SAME.

Energy savings = 458 MBTU/yr (elec.)

RS&H

SUBJECT LEAD ECO #11 AEP NO

SHEET 4 OF 5

DESIGNER DATE

CHECKER DATE

ECO (CONT.)

BLAST BOOTH FAN SHUT OFF BLDG 37

REF 4: LEAD, EEAP, RSH, 1981, VOL. 2, PROJ H, CALC. pg X-1

FAN MOTOR HP = 20 (REF 4)

CURRENT ENERGY CONSUMED

ASSUME: 2 SHIFT OPERATION

20 HP X .746 KW/HP X 16 H/d X 5d/w X 52 w/yr = 62100 KWh/yr

62100 KWh/yr X $\frac{3413 \text{ BTU/KWh}}{10^6 \text{ BTU/MBTU}}$ = 212 MBTU/yr

212 * 10.94 = $2319

SAVINGS

ASSUME: BLASTING OCCURS ½ TIME,

ENERGY

212 MBTU/yr x 0.5 = 106 MBTU/yr ELEC

COST

106 MBTU/yr x $10.94/MBTU = $1160/yr

RS&H

SUBJECT LEAD ECO #11

AEP NO

SHEET 5 OF 5

DESIGNER

DATE

CHECKER

DATE

SUMMARY SAVINGS

BLDG	BOOTH	ENERGY (MBTU ELEC/YR)	ENERGY COST SAVINGS ($)
350	49	458	5010
350	50	583	6380
350	2544	458	5010
37	—	106	1160
TOTAL		1,610	17,600

CONSTRUCTION COST

FOR ALL 4 BOOTHS = $6530

PAY BACK

$\frac{\$7280}{\$17600/yr} = 0.41$ YRS.

QRIP Calc's

Current energy use: $\$10,000 + \$12,300 + \$17,800 + \$2319$

$= \$37,919$

05/09/91

ECO Construction Cost Estimate Calculations

ECO Name: Building 350 &37 blast booth fan control

ECO #: 11

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$1,150
Labor	$2,850
Subtotal bare costs	$4,000
FICA Insurance (20% of Labor)	$570
Sales Tax (6.5% of Material)	$75
Subtotal	$4,645
Overhead (15%)	$697
Subtotal	$5,342
Profit (10%)	$534
Subtotal	$5,876
Bond (1%)	$59
Subtotal	$5,935
Contingency (10%)	$594
Subtotal (Construction Cost Input For LCCID *)	$6,529
SIOH (5.5% of Construction Cost)	$359
Subtotal	$6,888
Design (6% of Construction Cost)	$392
Total Project Cost	$7,280

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE

DATE PREPARED

SHEET OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: Letterkenny Army Depot

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE
- ☐ CODE A (No design completed)
- ☐ CODE B (Preliminary design)
- ☐ CODE C (Final design)
- ☐ OTHER (Specify)

DRAWING NO.

ESTIMATOR: G. F.

CHECKED BY: P. Hutchins

AUTO SHUT DOWN BLAST BOOTH FANS. SUMMARY

	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
Limit Switches	2	ea	32	64	42	84	148
Wire 2-14	2	CLF	26.75	54	6.22	12	66
Conduit ½" ø	200	LF	2.97	594	.96	192	786
Cost per Booth				712		288	1000
4 Booths.				x 4		x 4	x 4
				2850		1150	4000

ENG FORM 150
1 AUG 59

(ER 1110-345-730)

PREVIOUS EDITION MAY BE USED

* U.S. GOVERNMENT PRINTING OFFICE : 1959 O—516140

(TRANSLUCENT)

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS
For use of this form, see AR 5-4; the proponent agency is OCA.

1. PROJECT NO.: AMC QRIP

REQUIREMENT CONTROL SYMBOL DD-M(R) 1561

2. TO:
HQ DA
Attn: DACS-DME
Pentagon
Washington, DC 20310-2070

3. THRU:
US AMC
Attn: AMCMM-M
5001 Eisenhower Ave.
Alexandria, VA 22303-0001

4. FROM:
Commander
US DESCOM
Attn: AMSDS-RM-P
Chambersburg, PA 17201-4170

5. DOD COMP NAME: Army
6. DOD COMP CODE: A
7. COMMAND CODE: W73QKK
8. DATE: 10/9/91

9. PROJECT TITLE: Modular Personnel Offices

10. TYPE OF PROJECT (Check one): [X] QRIP [ ] OSD PIF [ ] PECIP

11. AMORTIZATION YEARS/MONTHS: $ 26,039 (Project Cost) + 13,600 (Average Annual Savings) X 12 (No. Mos) = 1.9 (years) or -- (months) (amortization)

12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR: 024

13. ECONOMIC LIFE: 25 yrs

14. EXPECTED OPERATIONAL DATE:

15. SUBMITTING UNIT(S):
Commander
Letterkenny Army Depot
Attn: SDSLE-EM (T. Hagie)
Bldg. 663
Chambersburg, PA 17201-4150

16. UNIT ID CODE:

17. PROJECT DESCRIPTION:
Install modular offices with self-contained heating and cooling systems in three warehouses (#63, 8 and 9). Reset open area thermostats from 68°F to 55°F.

18. DETAILED JUSTIFICATION:
Installing modular offices in storage warehouses will allow the occupants to decrease the space heating temperatures in open storage areas while maintaining higher comfort levels in the modular offices. This action will save heating fuel oil.

19. SAVINGS DISPOSITION:
Savings are used to reduce energy expenditures.

20. OTHER REMARKS (Continue on page 5, if more space is needed):

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

21a. SUMMARY OF DOLLAR SAVINGS
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY *(Identify)* Electricity and #2 fuel oil	$36,100	$22,500	$22,500	$22,500	$22,500	$13,600	$13,600	$13,600	$13,600
CONTRACT COSTS									
OTHER *(Identify)* _____									
TOTALS	$36,100	$22,500	$22,500	$22,500	$22,500	$13,600	$13,600	$13,600	$13,600

b. PRIORITIZATION

(1) INTERNAL RATE OF RETURN *(IRR)*

Divide estimated project cost 26,039 by average annual savings $13,600 = 1.9 factor.

Based on factor and number of years economic life of the project, select the IRR from Table H-3, App H, Ch. 5, AR 5-4 = 65 % IRR.

(2) SAVINGS TO INVESTMENT RATIO *(S/I)*

Multiply annual savings 13,600 X discount factor 9,524 = 129,500 and divide by present value of investment *(undiscounted)* 26,039 = 5.0 S/I.

(Based on economic life 25 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) RATE OF INVESTMENT PER MANPOWER SPACE *(RIMS)* N/A

Divide estimated project cost _____ by number of manpower space savings _____ = _____ RIMS.

(Manpower requivalents cannot be used in this computation.)

Page 2 of DA Form 5108-R

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)—Continued.

22. COST FOR PROJECT TO BECOME OPERATIONAL

EQUIPMENT TYPE a	PROPOSED SOURCE OF PROCUREMENT b	UNIT PRICE c	QUANTITY d	TOTAL COST e	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT f	FY FUNDS REQUIRED g
(1) Modular Offices		$8,680	3	$26,039		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION *(Equipment delivery)*						
(7) EQUIPMENT MODIFICATION[1]						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT[2]						
(10) FACILITIES MODIFICATION[3]						
(11) TRAINING						
(12) OTHER *(Specify)*:						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL[4]				$26,039		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				$26,039		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE[5]				-		
(16) TOTAL *(Sum of (14) + (15) above)*				$26,039		

[1] *Not to exceed 10% of equipment cost for QRIP projects.*

[2] *Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.*

[3] *Normally not OPA funded.*

[4] *Used to compute amortization in Item 11.*

[5] *Specify source to include certification that funds are available, if financed from the regular budget:*

Page 3 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

23. SUMMARY OF SAVINGS *(MANPOWER AND DOLLARS)*

ITEMS	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR	TYPE PERS[6]	DOLLARS	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
a	b	c	d	e. FROM	f. TO	g. FROM	h. TO	i. FROM	j. TO
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS[7]									
(7) OTHER DOLLAR SAVINGS *(Excluding Manpower)*, e.g., CONTRACT COSTS & UTILITIES									
(8) #2 Fuel Oil			$13,800						
(9) Electricity			-200						
(10)									
(11) TOTAL DOLLAR SAVINGS			$13,800						

[6] *(1) US Graded*
(2) US Wage Board
(3) DHFN
(4) IHFN
(5) Officer
(6) WO
(7) Enlisted

[7] *Reflect specific duties being performed with additional manhours available (equivalent manyears)*

Page 4 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

24. REGULATORY APPROVAL/COORDINATION		
a. INVESTMENT STATEMENT This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints. *(Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)*		
b. OTHER COORDINATION *(Functional Coordination at local level, e.g., Fac Eng, Log, Pers. etc.)*		
25. SUBMITTED BY *(Typed name, grade and title of Subordinate Command/Agency or Project Initiator)*	SIGNATURE	DATE *(YYMMDD)* AUTOVON
26. APPROVAL RECOMMENDED BY *(MACOM/Agency)*	SIGNATURE	DATE *(YYMMDD)* AUTOVON
FOR USE BY HQDA ON OSD PIF PROJECTS ONLY		
27. APPROVED BY	SIGNATURE	DATE *(YYMMDD)* AUTOVON
28. OTHER REMARKS *(Cont'd)*		

Page 5 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

ECO Number: 15

MODULAR OFFICES IN BUILDINGS 6 SOUTH, 8 AND 9

Discussion

The temperature in these warehouses is maintained at 68°F (and higher) primarily for operator comfort. A tremendous amount of energy is required to heat the entire warehouse to 68°F. This project consists of installing modular 10 X 12 foot offices inside these warehouses, maintaining 68°F in the offices and reducing the temperature of the warehouse to 55°F. The results are shown below.

Recommendations

Based on the Life Cycle Cost Analysis, this project is recommended.

Construction Cost	$23,352
Annual Energy Savings (MBtu/yr)	
No. 2 Fuel Oil	2,775
Electricity	(20)
Annual Energy Cost Savings ($/yr)	$13,600
SIR	11.2
Simple Payback (years)	1.9

LIFE CYCLE COST ANALYSIS SUMMARY — STUDY: ECO15
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) — LCCID 1.062
INSTALLATION & LOCATION: LETTERKENNY ADREGION NOS. 3 CENSUS: 1
PROJECT NO. & TITLE: ECO #15 MODULAR OFFICES IN WAREHOUSING
FISCAL YEAR 1992 DISCRETE PORTION NAME: TOTAL PROJECT
ANALYSIS DATE: 10-14-91 ECONOMIC LIFE 25 YEARS PREPARED BY: W. TODD

1. INVESTMENT

A. CONSTRUCTION COST	$ 23352.
B. SIOH	$ 1285.
C. DESIGN COST	$ 1402.
D. SALVAGE VALUE COST	-$ 0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	$ 26039.

2. ENERGY SAVINGS (+) / COST (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	$ 10.94	-20.	$ -219.	15.11	-3306.
B. DIST	$ 4.98	2775.	$ 13820.	21.31	294494.
C. RESID	$ 4.41	0.	$ 0.	25.22	0.
D. NAT G	$ .00	0.	$ 0.	20.70	0.
E. COAL	$ .00	0.	$ 0.	15.93	0.
F. TOTAL		2755.	$ 13601.		$ 291187.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)		$ 0.
(1) DISCOUNT FACTOR (TABLE A)	14.53	
(2) DISCOUNTED SAVING/COST (3A X 3A1)		$ 0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)		$ 0.
D. PROJECT NON ENERGY QUALIFICATION TEST		
(1) 25% MAX NON ENERGY CALC (2F5 X .33)	$ 96092.	
A IF 3D1 IS = OR > 3C GO TO ITEM 4		
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)_____		
C IF 3D1B IS = > 1 GO TO ITEM 4		
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY		

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YRS ECONOMIC LIFE)) $ 13601.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 291187.

6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 11.18
(IF < 1 PROJECT DOES NOT QUALIFY)

7. SIMPLE PAYBACK PERIOD (ESTIMATED) SPB=1F/4 1.91

REYNOLDS, SMITH AND HILLS
ARCHITECTS • ENGINEERS • PLANNERS
INCORPORATED

SUBJECT Modular Offices LEAD
DESIGNER W.T. Todd
CHECKER P. Hutchins

AEP NO 290-0379-001
SHEET 1 OF
DATE 4/18/91
DATE Rev. 9-25-91

ECO # 15

Modular offices for personnel in Buildings 6s, 8 & 9

Assumptions:

1. The indoor temperature for these warehouses is currently maintained at 68 °F.

2. The heating for these buildings is provided by the boilers in building 8, which burn Fuel oil # 2.

3. The operation hours for these buildings are 8 hours per day, 5 days per week (2080 hrs/yr.)

4. The warehouse temperature can be reduced to 55 °F while maintaining 68 °F in the modular offices.

5. The modular offices will also be cooled to 75 °F during the summer months.

6. The average indoor temperature during the summer months is currently about 80 °F.

7. Since the wall and roof U-values and the infiltration rate do not change, the heat losses from the buildings is determined by the indoor-outdoor temperature difference and the amount of time heating is required.

Current energy consumption:

Annual fuel oil deliveries*:

FY 87	=	71,478 gal/yr
FY 88	=	63,607
FY 89	=	27,283
FY 90	=	46,446
Total		208,814 gal/4 years

* From Letterkenny Army Depot, Fuel Consumption Report, Building 8 Boilers.

Average fuel oil consumption = $\frac{208{,}814 \text{ gal}}{4 \text{ years}}$ = 52,203 gal/yr

Buildings 6, 8 and 9 are approximately the same size so the energy use for each building is about:

52203 gal/yr ÷ 3 = 17,401 gal/yr per building

17,401 gal/yr × 0.13869 $\frac{\text{mBtu}}{\text{gal}}$ = 2413 mBtu/yr per bldg.

TOTAL USE FOR ALL BLDGS = 2413 × 3 = 7239 mBtu/yr

Energy Savings:

Bin temperature data were used to calculate the potential energy savings when the indoor temperature is reduced from 68°F to 55°F.

From the spreadsheet calculations the sum of the (indoor temperature - average outdoor temperature) x hours of occurrence for 68°F is: 153,752 degree hours per year

This value corresponds to the total current energy use.

The degree hours for 55 °F indoor temperature is:

82,338 degree hours

$$\text{Energy savings} = \frac{153{,}572 \text{ deg hrs} - 82{,}338 \text{ deg hrs}}{153{,}572 \text{ deg hrs}} = 0.46$$

$$\text{Energy Savings} = 2413 \frac{\text{MBtu}}{\text{Yr}} \times 0.46 = 1110 \frac{\text{MBtu}}{\text{Yr}} \text{ ea. for bldgs. 8 \& 9}$$

Savings for bldg. 6's will be 50% of the above value since half the bldg. is offices.

Additional Energy Use:

To maintain office temperature an electric a/c and heating unit will be utilized. It's energy use is:

$Q = UA\Delta T$

U_{wall}:

air film	R = 0.68	From 1989 ASHRAE Fund.
1/8" hardboard	R = 0.125 ÷ 1.2 = 0.10	
3" air space	R = 0.90	
1/8" hard board	R = 0.10	
air film	R = 0.68	
	R_T = 2.46	

$U_w = 1/R_T = 0.41 \text{ Btu/hr·ft}^2\text{·°F}$

$U_{window} = 1.10 \text{ Btu/hr·ft}^2\text{·°F}$ (1989 ASHRAE Fundamentals)

$U_{ceiling}$:

air film	R = 0.76	from 1989 ASHRAE Fund.
1/2" Acc. Tile	R = 1.25	
air film	R = 0.76	
	R_T = 2.77	

$U_{ceiling} = 1/R_T = 0.36 \text{ Btu/hr·ft}^2\text{·°F}$

Wall area = $A_w = (10' \times 8' + 12' \times 8') \times 2 = 352\ ft^2 - A_{wi}$

Window area = $A_{wi} = 3' \times 3' \times 6 = 54\ ft^2$

Ceiling area = $A_c = 10' \times 12' = 120\ ft^2$

$$Q = U_w \times A_w \times \Delta T + U_{wi} \times A_{wi} \times \Delta T + U_c \times A_c \times \Delta T$$

$\Delta T_w = 68°F - 55°F = 13°F$ winter

$\Delta T_s = 80°F - 75°F = 5°F$ Summer

$$Q = (0.41 \times 298 + 1.10 \times 54 + 0.36 \times 120)\ Btu/hr \cdot °F \times \Delta T$$

$$Q_s = 224.8\ \frac{Btu}{hr \cdot °F} \times 5°F = 1124\ Btu/hr$$

$$Q_w = 224.8\ \frac{Btu}{hr \cdot °F} \times 13°F = 2922\ Btu/hr$$

Heating hours = 1,465 hours/year (from bin data)

Heating energy = $1465\ hr/yr \times 2922\ Btu/hr = \underline{4.3\ mBtu/yr}$

$$4.3\ \frac{mBtu}{yr} \times 10.94\ \$/mBtu = \underline{\$47/year}$$

Cooling hours = $9\ hr/day \times 260\ day/yr - 1465\ hr/yr = 875\ hr/yr$

Cooling efficiency: assume an EER of 8 Btu/watt

Cooling energy = $1124\ Btu/hr + 1500w \times \frac{3.413\ Btu/hr}{w}$ (appliance & people loads) $= 6224\ \frac{Btu}{hr \cdot Bldg}$

Cooling energy = $6244\ Btu/hr \div 8\ \frac{Btu}{w} \times \frac{1\ kw}{1000w} \times 875\ hr/yr = 683\ kwh/yr \cdot Bldg$

Cooling energy = $683 \frac{Kwh}{yr} \times \frac{3413\ Btu}{Kwh} \times \frac{MBtu}{10^6 Btu} = 2.3\ MBtu/yr.Bldg$

$2.3\ MBtu/yr \times 10.94\ \$/MBtu = \$25/yr.Bldg.$

Total additional energy use = $\left(4.3 \frac{MBtu}{yr.B} + 2.3 \frac{MBtu}{yr.B}\right) \times 3\ Bld. = 20 \frac{MBtu}{yr}$

Total additional energy cost = $\left(47 \frac{\$}{yr.B} + 25 \frac{\$}{yr.B}\right) \times 3\ Bldg. = \$216/yr$

Energy Cost Savings:

$1110 \frac{MBtu}{yr} \times 4.98\ \$/MBtu = \$5528/yr$ for bldgs. 8 & 9

$1110 \frac{MBtu}{yr} \times 4.98\ \$/MBtu \times 0.5 = \$2764/yr$ for bldg 6 s

Net Energy Savings:

#2 Fuel oil : $1110 \frac{MBtu}{yr.Bl.} \times 2.5\ Bl. = 2775\ MBtu/yr$
Elec : $(4.3 + 2.3) \times 3 = (20)\ MBTu/yr$

Net Energy Savings = Energy Savings - Add. energy use

$= 2{,}775\ MBtu/yr - 20\ MBtu/yr$

$= 2{,}755\ MBtu/yr$

Net Energy Cost Savings:

Net energy cost savings = $\$5528/yr * 2.5\ Bldgs. - \$216/yr$

$= \$13{,}600/yr$

Project Cost :

Total Project Cost = #26,037

See cost estimate sheets for details

Simple Payback :

Payback = Cost ÷ Savings

= #26,037 ÷ #13,600/yr

Payback = 1.9 years

QRIP Calc.s

Present energy use = 7239 MBTu/yr #2 fuel oil

cost = 7239 × 4.98 = #36,100/yr

Proposed method = 4464 MBtu/yr #2 fuel oil
20 MBtu/yr electricity

cost = 4,464 × 4.98 + 20 × 10.94
= #22,500

ENERGY AUDIT OF INDUSTRIAL FACILITIES
LETTERKENNY ARMY DEPOT

Operation hours per day = 24
Operation days per week = 7

Indoor Air Temperature (F) = 55

Hour Fractions: 1 AM - 9 AM 1
9 AM - 5 PM 1
5 PM - 1 AM 1

Temperature Range		Hours of Occurrence 2-9	10-17	18-1	Net Hours	Delta T	Total Deg Hrs	Net Deg Hrs
70	74	247	237	301	785	-17	0	0
65	69	296	217	278	791	-12	0	0
60	64	269	196	236	701	-7	0	0
55	59	249	191	209	649	-2	0	0
50	54	221	193	202	616	3	1,848	1,848
45	49	218	193	206	617	8	4,936	4,936
40	44	237	236	239	712	13	9,256	9,256
35	39	289	246	286	821	18	14,778	14,778
30	34	304	194	258	756	23	17,388	17,388
25	29	184	106	152	442	28	12,376	12,376
20	24	124	65	90	279	33	9,207	9,207
15	19	75	32	57	164	38	6,232	6,232
10	14	54	13	26	93	43	3,999	3,999
5	9	18	3	9	30	48	1,440	1,440
0	4	9	0	2	11	53	583	583
-5	-1	3	0	1	4	58	232	232
-10	-6	1	0	0	1	63	63	63
-15	-11	0	0	0	0	68	0	0
Totals		2798	2122	2552	7472		82338	82338

Total operation hours while heating
corrected for working days/week = 4546 Hours/Yr

Total degree hours per year corrected for
working days per week = 82338 Degree hours

Average outdoor temperature while heating = 36.9 F

05/14/91

ECO Construction Cost Estimate Calculations

ECO Name: Modular Offices For Buildings 6-South, 8 and 9

ECO #: 15

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$14,385
Labor	$1,080
Subtotal bare costs	$15,465
FICA Insurance (20% of Labor)	$216
Sales Tax (6.5% of Material)	$935
Subtotal	$16,616
Overhead (15%)	$2,492
Subtotal	$19,108
Profit (10%)	$1,911
Subtotal	$21,019
Bond (1%)	$210
Subtotal	$21,229
Contingency (10%)	$2,123
Subtotal (Construction Cost Input For LCCID *)	$23,352
SIOH (5.5% of Construction Cost)	$1,284
Subtotal	$24,636
Design (6% of Construction Cost)	$1,401
Total Project Cost	$26,037

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE

DATE PREPARED: 4/19/91 | SHEET | OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: LetterKenny Army Depot

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE:
- [x] CODE A (No design completed)
- [ ] CODE B (Preliminary design)
- [ ] CODE C (Final design)
- [ ] OTHER (Specify)

DRAWING NO.

ESTIMATOR: W. T. Todd

CHECKED BY

Modular Office SUMMARY

	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
ET-120 10'x12' in							
plant office	3	Ea	160	480	4395	13185	
Shipping from Florida	3	Ea	—	—	250	750	
Electric wiring	3	Ea	200	600	150	450	
Sub total				1080		14,385	#15,465

GETCO, Inc.
P.O. Box 10432
Jacksonville, FL 32247-0432
(904) 791-9042 Fax: (904) 358-3906

Ship To:

REYNOLDS, SMITH & HILL
6737 SOUTHPOINT DRIVE
JAX, FL. 32216
ATTN: BILL TODD

Bill To:

Salesman: DAN
Cust Contact: BILL
Phone Number: 279-2281
Fax Number: 279-2491
Customer PO: _____

Date
Quote # ___ 4-12-91
Order # ___ _____
Inv # ___ _____

Qty.	Unit	Stock #	Description	U	Cat.	Unit Wgt.	Total Weight	Unit List	Total List	Disc.	Unit Cost	Total Cost	Unit Sell	Total Sell
1	EA.	ET-120 10'X12' IN-PLANT												
		OFFICE BUILDING COMPLETE												
		WITH THE FOLLOWING:												
		1-STD. DOOR, 6-WINDOWS,												
		1-HVAC UNIT, 4-110V OUTLETS,												
		1-220V OUTLETS, 1-LIGHT SWITCH												
		2-4 TUBE FLOURESCENT FIXTURES,												
		1-4 CIRCUIT BREAKER BOX							$4469.00					$4395.00
		ABOVE PRICE F.O.B. HIALEAH, FL.												
		ALLOW 3 WKS A.R.O. DELIVERY												
		Delivery Charges												
						T.W.			T.L.					

New and Used Warehouse Equipment
Sales and Service

GETCO, INC.

Dan Caswell

P.O. Box 10432
Jacksonville, Florida 32247-0432
(904) 791-9042

1780 W. Beaver St.
Jacksonville, Florida 32209

ENERGY AUDIT OF INDUSTRIAL FACILITIES
LETTERKENNY ARMY DEPOT

Operation hours per day = 24
Operation days per week = 7

Indoor Air Temperature (F) = 60

Hour Fractions: 1 AM - 9 AM 1
9 AM - 5 PM 1
5 PM - 1 AM 1

Temperature Range		Hours of Occurrence 2-9	10-17	18-1	Net Hours	Delta T	Total Deg Hrs	Net Deg Hrs
70	74	247	237	301	785	-12	0	0
65	69	296	217	278	791	-7	0	0
60	64	269	196	236	701	-2	0	0
55	59	249	191	209	649	3	1,947	1,947
50	54	221	193	202	616	8	4,928	4,928
45	49	218	193	206	617	13	8,021	8,021
40	44	237	236	239	712	18	12,816	12,816
35	39	289	246	286	821	23	18,883	18,883
30	34	304	194	258	756	28	21,168	21,168
25	29	184	106	152	442	33	14,586	14,586
20	24	124	65	90	279	38	10,602	10,602
15	19	75	32	57	164	43	7,052	7,052
10	14	54	13	26	93	48	4,464	4,464
5	9	18	3	9	30	53	1,590	1,590
0	4	9	0	2	11	58	638	638
-5	-1	3	0	1	4	63	252	252
-10	-6	1	0	0	1	68	68	68
-15	-11	0	0	0	0	73	0	0
Totals		2798	2122	2552	7472		107015	107015

Total operation hours while heating
corrected for working days/week = 5195 Hours/Yr

Total degree hours per year corrected for
working days per week = 107015 Degree hours

Average outdoor temperature while heating = 39.4 F

ENERGY AUDIT OF INDUSTRIAL FACILITIES
LETTERKENNY ARMY DEPOT

Operation hours per day = 24
Operation days per week = 7

Indoor Air Temperature (F) = 68

Hour Fractions: 1 AM - 9 AM 1
9 AM - 5 PM 1
5 PM - 1 AM 1

Temperature Range		Hours of Occurrence 2-9	10-17	18-1	Net Hours	Delta T	Total Deg Hrs	Net Deg Hrs
70	74	247	237	301	785	-4	0	0
65	69	296	217	278	791	1	791	791
60	64	269	196	236	701	6	4,206	4,206
55	59	249	191	209	649	11	7,139	7,139
50	54	221	193	202	616	16	9,856	9,856
45	49	218	193	206	617	21	12,957	12,957
40	44	237	236	239	712	26	18,512	18,512
35	39	289	246	286	821	31	25,451	25,451
30	34	304	194	258	756	36	27,216	27,216
25	29	184	106	152	442	41	18,122	18,122
20	24	124	65	90	279	46	12,834	12,834
15	19	75	32	57	164	51	8,364	8,364
10	14	54	13	26	93	56	5,208	5,208
5	9	18	3	9	30	61	1,830	1,830
0	4	9	0	2	11	66	726	726
-5	-1	3	0	1	4	71	284	284
-10	-6	1	0	0	1	76	76	76
-15	-11	0	0	0	0	81	0	0
Totals		2798	2122	2552	7472		153572	153572

Total operation hours while heating
corrected for working days/week = 6687 Hours/Yr

Total degree hours per year corrected for
working days per week = 153572 Degree hours

Average outdoor temperature while heating = 45.0 F

ENERGY AUDIT OF INDUSTRIAL FACILITIES
LETTERKENNY ARMY DEPOT

Operation hours per day = 8
Operation days per week = 5

Indoor Air Temperature (F) = 68

Hour Fractions:
1 AM - 9 AM 0.25
9 AM - 5 PM 0.75
5 PM - 1 AM 0

Temperature Range		Hours of Occurrence 2-9	10-17	18-1	Net Hours	Delta T	Total Deg Hrs	Net Deg Hrs
70	74	247	237	301	240	-4	0	0
65	69	296	217	278	237	1	791	237
60	64	269	196	236	214	6	4,206	1,286
55	59	249	191	209	206	11	7,139	2,261
50	54	221	193	202	200	16	9,856	3,200
45	49	218	193	206	199	21	12,957	4,184
40	44	237	236	239	236	26	18,512	6,143
35	39	289	246	286	257	31	25,451	7,959
30	34	304	194	258	222	36	27,216	7,974
25	29	184	106	152	126	41	18,122	5,146
20	24	124	65	90	80	46	12,834	3,669
15	19	75	32	57	43	51	8,364	2,180
10	14	54	13	26	23	56	5,208	1,302
5	9	18	3	9	7	61	1,830	412
0	4	9	0	2	2	66	726	149
-5	-1	3	0	1	1	71	284	53
-10	-6	1	0	0	0	76	76	19
-15	-11	0	0	0	0	81	0	0
Totals		2798	2122	2552	2291		153572	46172

Total operation hours while heating corrected for working days/week = 1465 Hours/Yr

Total degree hours per year corrected for working days per week = 32980 Degree hours

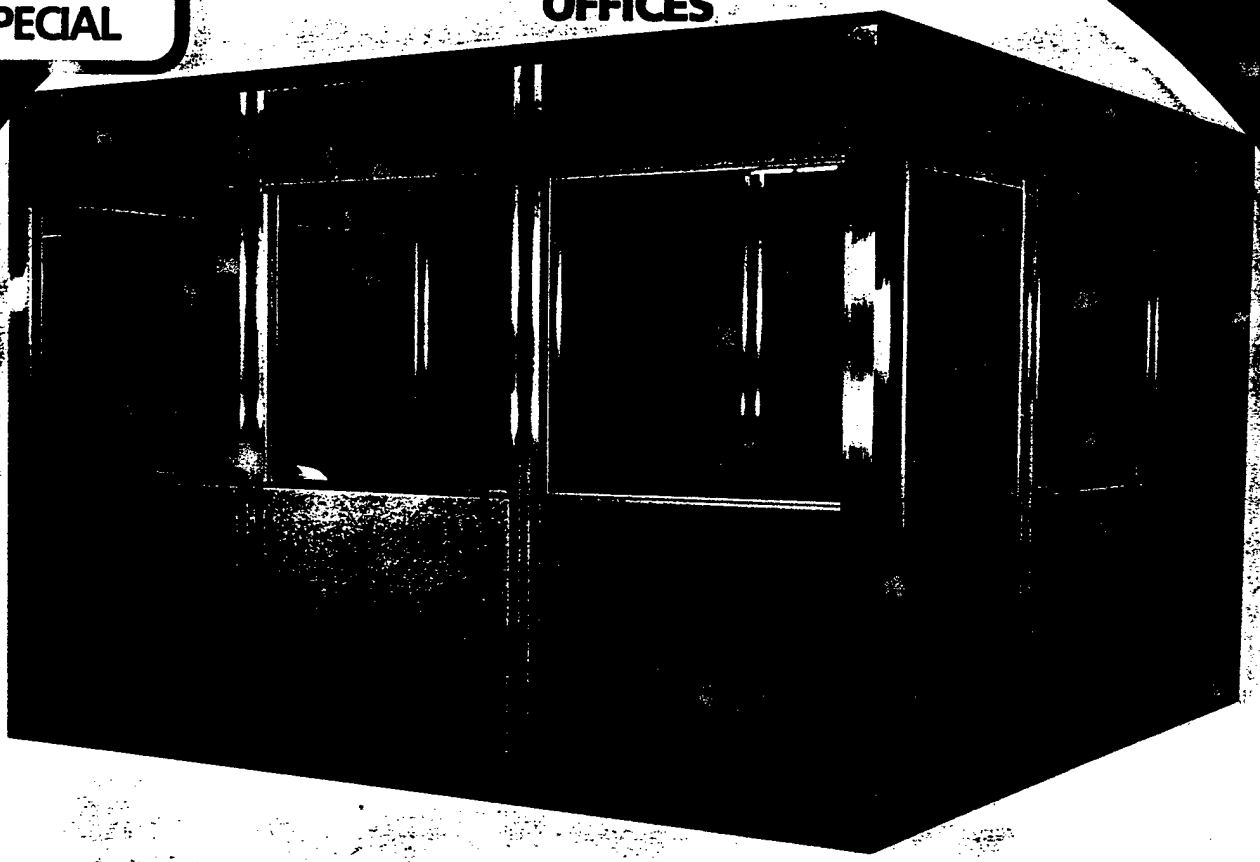
Average outdoor temperature while heating = 45.0 F

LETTERKENNY ARMY DEPOT
FUEL CONSUMPTION REPORT
IN GALLONS

BLDG	YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YEARLY TOTAL
** BOILER LOCATION: BUILDING 1					SERVES BUILDINGS: 1, 2									FUEL TYPE: 5
1	FY87	4545	2640	728	2810	3401	6278	10899	6000	17985	2112	3989	8052	69439
1	FY88	0	21786	9197	4575	16052	4647	10351	225	2472	0	0	0	69305
1	FY89	294	5623	9885	2697	16802	3138	10534	706	91	1321	1027	4165	56283
1	FY90	6864	10838	851	8832	15574	2377	-1	4007	0	1386	378	0	51106
** BOILER LOCATION: BUILDING 2					SERVES BUILDINGS: 4, 7									FUEL TYPE: 2
2	FY87	896	732	4206	9777	9384	8246	2710	2636	3836	3636	2916	190	49165
2	FY88	8018	943	10711	12793	27167	15963	12033	8226	4936	21796	4113	1233	127932
2	FY89	2112	6053	602	2783	11941	1044	10607	1107	0	0	0	0	36249
2	FY90	5131	14811	17118	20647	4276	4882	2137	0	0	1220	4410	0	74632
** BOILER LOCATION: BUILDING 3					SERVES BUILDINGS: 3, 5									FUEL TYPE: 5
3	FY87	756	6275	908	6695	15	1361	1931	2617	4275	8198	15139	5951	54121
3	FY88	3368	6455	13284	11511	3649	7043	4445	6164	392	0	0	0	56311
3	FY89	0	12449	4999	4672	17211	5886	2140	1230	0	179	228	1266	50260
3	FY90	3787	1852	2154	7188	11293	4493	-1	0	0	0	0	0	30766
** BOILER LOCATION: BUILDING 8					SERVES BUILDINGS: 6, 8, 9									FUEL TYPE: 2
8	FY87	1088	7035	13054	16931	13780	9278	9475	163	0	0	123	551	71478
8	FY88	0	8435	10865	1249	24192	0	4246	77	0	3544	3534	7465	63607
8	FY89	9612	4042	2798	4808	446	4719	336	522	0	0	0	0	27283
8	FY90	3614	8846	9613	11906	7665	1679	3123	0	0	0	0	0	46446
** BOILER LOCATION: BUILDING 10					SERVES BUILDINGS: 10									FUEL TYPE: 2
10	FY87	254	66	77	96	129	65	106	83	0	356	250	0	1482
10	FY88	530	1177	4509	3631	2993	3240	637	619	0	206	121	58	17721
10	FY89	103	1982	3918	4290	2413	2534	910	215	0	300	2703	500	19868
10	FY90	0	1315	4433	4942	2225	789	0	0	0	0	0	0	13704
** BOILER LOCATION: BUILDING 12					SERVES BUILDINGS: 12, 13, 14									FUEL TYPE: 5
12	FY87	1794	1732	833	2938	4103	2987	961	31	62	4	92	184	15721
12	FY88	369	2414	3949	4405	3537	2370	1547	131	0	0	0	0	18722
12	FY89	800	2507	4263	2818	3824	2596	789	269	0	0	0	0	17866
12	FY90	675	3428	2929	1432	2430	3067	521	0	0	0	0	0	14482
** BOILER LOCATION: BUILDING 37HP					SERVES BUILDINGS: 37									FUEL TYPE: 2
37HP	FY87	3506	3583	2147	6008	4366	3582	3763	4823	1153	5113	3037	5424	46505
37HP	FY88	4633	4840	5453	6893	6583	7643	2435	5611	6266	7803	2280	6856	67296
37HP	FY89	2625	5712	6551	6816	8100	5837	5824	1110	1108	3660	6957	3379	57679
37HP	FY90	5486	9712	5367	4934	5666	9263	8553	1012	0	0	0	0	49993
** BOILER LOCATION: BUILDING 37N					SERVES BUILDINGS: 37									FUEL TYPE: 5
37N	FY87	101	1477	4097	4079	4300	3586	1307	155	0	0	40	40	19182
37N	FY88	731	3099	1571	2750	10474	4706	4820	156	312	624	1248	960	31451
37N	FY89	1920	1951	266	3412	4256	3531	1084	123	0	0	0	0	16543
37N	FY90	1553	5008	7038	1798	2996	5695	1079	0	0	0	0	0	25167

TIGER SPECIAL

ECONO-THREE OFFICES



National ECONO-THREE modular in-plant offices are designed for applications where cost is a major consideration.

Although low in price, these attractive enclosures offer full 3" thick, 3-ply wall panels constructed of ⅛" 4 mil vinyl-clad hardboard (each side) over a kraft honeycomb core. All panels are completely interchangeable and reuseable.

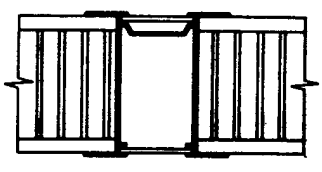
Features include pre-hung, pre-finished oak woodgrain doors, pre-painted steel-ribbed roof deck and one-piece mill-finished extruded aluminum connection and corner posts allowing fast on-site assembly.

System incorporates all of National's quality features including exclusive "Wire-Pak" modular snap-together, six-wire wiring system. Offices are also available in vision tower and two-story versions.

SEE PAGES 16 THROUGH 19 FOR CONSTRUCTION DETAILS.

SEE PAGE 26 FOR ARCHITECTURAL SPECIFICATIONS.

15-14



MODEL SELECTION CHART

ET64	8x8	958	ET320	16x20	2734
ET80	8x10	1012	ET336	12x28	2966
ET96	8x12	1246	ET384	12x32	3310
ET100	10x10	1260	ET388	16x24	3148
ET120	10x12	1418	ET400	20x20	3190
ET144	12x12	1590	ET448	16x28	3534
ET160	10x16	1734	ET480	20x24	3646
ET192	12x16	1934	ET512	16x32	3934
ET200	10x20	2050	ET560	20x28	4102
ET240	12x20	2278	ET640	20x32	4558
ET256	16x16	2334	ET720	20x36	5014
ET288	12x24	2622	ET800	20x40	5470

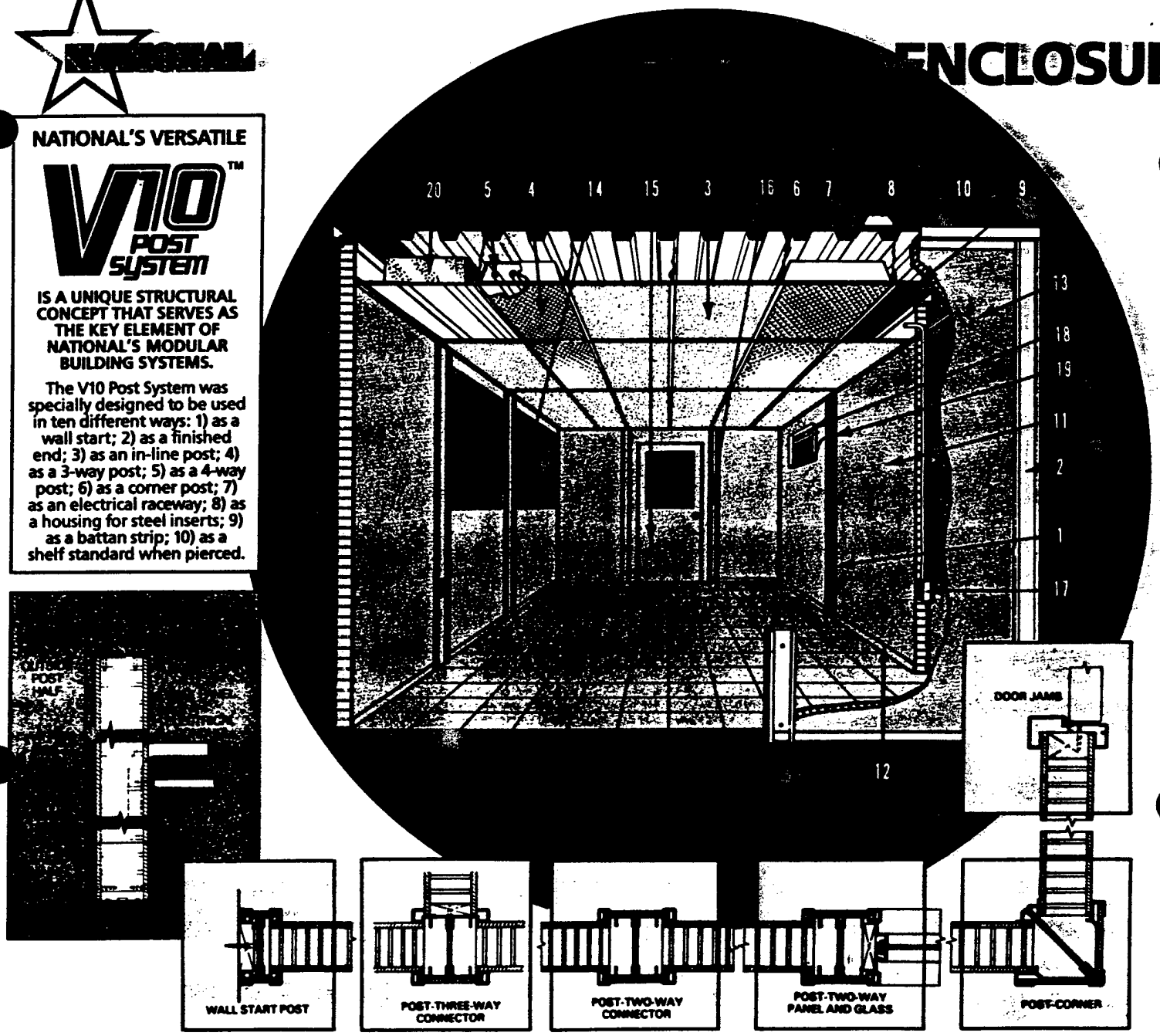
NATIONAL ENCLOSURE

NATIONAL'S VERSATILE

V10™ POST system

IS A UNIQUE STRUCTURAL CONCEPT THAT SERVES AS THE KEY ELEMENT OF NATIONAL'S MODULAR BUILDING SYSTEMS.

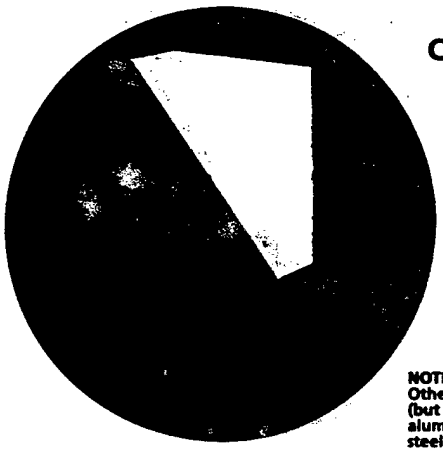
The V10 Post System was specially designed to be used in ten different ways: 1) as a wall start; 2) as a finished end; 3) as an in-line post; 4) as a 3-way post; 5) as a 4-way post; 6) as a corner post; 7) as an electrical raceway; 8) as a housing for steel inserts; 9) as a battan strip; 10) as a shelf standard when pierced.



1. **POSTS:** Extruded anodized aluminum with spring-held vinyl-clad feature strips to match interior/exterior panel facings (see V10™ information above).
2. **CORNER POSTS:** Massive two-piece anodized aluminum with matching vinyl-clad feature strips assure fastest possible assembly of corners.
3. **CEILING:** Attractive, white, random fissured, vinyl-faced fiberglass tile, easily cleaned to retain permanent beauty.
4. **INDIRECT LIGHTING:** Luminous fixture panels, as required, provide efficient, soft overall lighting without dark areas.
5. **CONCEALED LIGHTS:** Fluorescent, four-tube, lay-in troffer-type fixtures. Average 100 foot candles of illumination.
6. **TIE WIRES:** Fasten to roof deck with self-tapping screws and to ceiling grid main T's.
7. **ROOF DECK:** Designed to achieve optimum structural efficiency in 22 gauge steel (painted), provides clear spans up to 12 feet (20 feet with 6-inch joists).
8. **ROOF DECK END CLOSURES:** Rubber seals inserted in roof flutes contain heat and conditioned air. Insures dust-free interior.
9. **CEILING GRID:** White enameled "T" support system forms a rigid frame for light fixtures and ceiling tiles.
10. **PANEL CAPS:** Anodized aluminum panel caps incorporating fascia provide finishing touch to panels as seen from exterior.
11. **WALLS:** A full 3-inch thick with honeycomb core affords structural rigidity and effective "Sound Conditioning." 3/16" tempered hardboard facings, clad in choice of "DIAMOND-COAT" vinyl colors and finishes, retain beauty with minimum maintenance.
12. **CONTINUOUS BASE CHANNEL:** Heavy anodized aluminum base channel (fastened to floor) supports and secures wall panels. Trims bottom on interior and exterior.
13. **REMOVABLE PANELS:** Special design feature of panels allows easy removal providing access for large equipment, or replacement of damaged panels, without dismantling enclosure.
14. **WINDOWS:** Optional choice of picture, sliding or pass-thru (with or without shelf). All provided with tempered safety glass.
15. **DOORS:** Attractively faced in harmonizing vinyl. Pre-hung in aluminum jamb, complete with hardware, solid 20-inch by 30-inch door lite, and/or with 18-inch by 12-inch anodized aluminum grille are optional.
16. **WALL SWITCH:** Light switches are conveniently placed and attractive, conforming to National Code.
17. **WALL OUTLETS:** Conduit run with junction box, outlet or switch, cover plate offset fitting, conduit to reach ceiling plenum and connectors. All pre-assembled in interior posts to create vertical electric raceway.
18. **COMFORT CONTROL OPTIONS:** Include air conditioners (from 5,000 BTU to 12,000 BTU); 8-inch exhaust fan (wall-mounted), 180 CFM; heater up to 5,600 watts (Heat, off or fan) wall-mounted; anodized aluminum louver 12-inch by 18-inch.
19. **AIR CONDITIONER OUTLET:** 110 or 220 volt. (Breaker panel provided with the office kit allows separate circuit for air conditioner operation.)
20. **ENERGY-SAVER CONSTRUCTION (Optional):** Includes wall panels constructed of 3/16-inch vinyl-clad facings (each side) with an insulating polystyrene foam core (1 lb. density) and a 6-inch thick fiberglass blanket of insulation layed into the plenum area. Provides R-12 wall and R-19 roof rating.

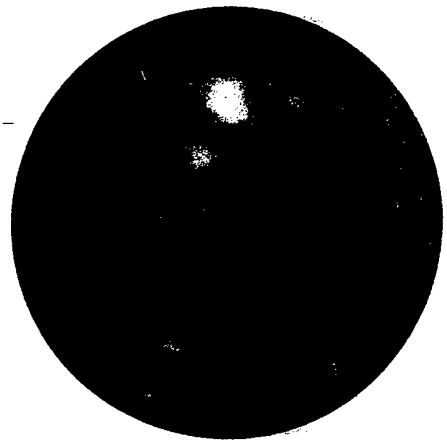
SEE PAGE 26 FOR ENGINEERING AND ARCHITECTURAL SPECIFICATIONS

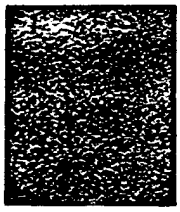
CONSTRUCTION DETAILS



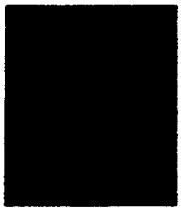
PANEL CONSTRUCTION DETAILS

NOTE:
Other facings such as (but not limited to) .032-inch aluminum, and panel cores utilizing steel studs and urethane are also available.





409-SAND



NC-251-HICKORY

STANDARD INTERIOR PANEL FINISHES – National offices are available in the standard vinyl finishes as shown at left. These and all optional finishes (except 801, 803 and 812 textured films) incorporate National's exclusive DIAMOND COAT™ described above.

401 SNOW WHITE | NC-159 PECAN | NC-150 WALNUT | NC-254 OAK | NC-156 ROSEWOOD | NC-157 NATURAL TEAK | 801 TAN CALCUTTA | 803 BEIGE CALCUTTA | 812 GREY CALCUTTA

OPTIONAL INTERIOR PANEL FINISHES
National laminates their own vinyl-clad panels and can provide the widest selection of colors and woodgrains in the industry. Cork and chaulk board facings are also available on request. Other finishes (not shown) can be supplied ... contact the factory. See actual swatch samples for exact color and finish.

OSD PIF

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS
For use of this form, see AR 5-4; the proponent agency is OCA.

1. PROJECT NO.: AMC OSD PIF

REQUIREMENT CONTROL SYMBOL DD-M(R) 1561

2. TO:
HQ DA
Attn: DACS-DME
Pentagon
Washington, DC 20310-2070

3. THRU:
US AMC
Attn: AMCMM-M
5001 Eisenhower Ave
Alexandria, VA 22303-0001

4. FROM:
Commander
US DESCOM
Attn: AMSDS-RM-P
Chambersburg, PA 17201-4170

5. DOD COMP NAME: Army

6. DOD COMP CODE: A

7. COMMAND CODE: W73QKK

8. DATE: 10/9/91

9. PROJECT TITLE
Dip Tank Covers and Exhaust Fan Controls

10. TYPE OF PROJECT (Check one)
☐ QRIP ☒ OSD PIF ☐ PECIP

11. AMORTIZATION YEARS/MONTHS
$ $210,257 (Project Cost) ÷ 137,400 (Average Annual Savings) X 12 (No. Mos)
= 1.5 (years) or - (months) (amortization)

12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR
024

13. ECONOMIC LIFE
15

14. EXPECTED OPERATIONAL DATE

15. SUBMITTING UNIT(S)
Commander
Letterkenny Army Depot
Attn: SDSLE-EM (T. Hagie)
Bldg. 663
Chambersburg, PA 17201-4150

16. UNIT ID CODE

17. PROJECT DESCRIPTION
Covers for dip tanks that will allow the exhaust fan speed to be reduced to provide reduced air flow requirements.

18. DETAILED JUSTIFICATION
Covering the dip tanks will reduce the ventilation air flow requirements. The reduced air flow will save energy.

19. SAVINGS DISPOSITION
Savings are used to reduce energy expenditures

20. OTHER REMARKS (Continue on page 5, if more space is needed)

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

21a. SUMMARY OF DOLLAR SAVINGS
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY *(Identify)* Electricity and #6 fuel oil	$209,500	$72,100	$72,100	$72,100	$72,100	$137,400	$137,400	$137,400	$137,400
CONTRACT COSTS									
OTHER *(Identify)* _____									
TOTALS	$209,500	$72,100	$72,100	$72,100	$72,100	$137,400	$137,400	$137,400	$137,400

b. PRIORITIZATION

(1) INTERNAL RATE OF RETURN *(IRR)*

Divide estimated project cost $209,500 by average annual savings 137,400 = 1.5 factor.

Based on factor and number of years economic life of the project, select the IRR from Table H-3, App H, Ch. 5, AR 5-4 = 110 % IRR.

(2) SAVINGS TO INVESTMENT RATIO *(S/I)*

Multiply annual savings 137,400 X discount factor 7.98 = 1,096,500 and divide by present value of investment *(undiscounted)* 210,257 = 5.2 S/I.

(Based on economic life 15 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) RATE OF INVESTMENT PER MANPOWER SPACE *(RIMS)* N/A

Divide estimated project cost _____ by number of manpower space savings _____ = _____ RIMS.

(Manpower requivalents cannot be used in this computation.)

Page 2 of DA Form 5108-R

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)—Continued.

22. COST FOR PROJECT TO BECOME OPERATIONAL

EQUIPMENT TYPE a	PROPOSED SOURCE OF PROCUREMENT b	UNIT PRICE c	QUANTITY d	TOTAL COST e	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT f	FY FUNDS REQUIRED g
(1) Dip Tank Covers	-	$1,404	39	$54,765		
(2) Exhaust Fan Controls		$7,775	20	$155,492		
(3)						
(4)						
(5)						
(6) TRANSPORTATION (Equipment delivery)						
(7) EQUIPMENT MODIFICATION[1]						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT[2]						
(10) FACILITIES MODIFICATION[3]						
(11) TRAINING						
(12) OTHER (Specify):						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL[4]				$210,257		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				$210,257		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE[5]				-		
(16) TOTAL (Sum of (14) + (15) above)				$210,257		

[1] *Not to exceed 10% of equipment cost for QRIP projects.*

[2] *Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.*

[3] *Normally not OPA funded.*

[4] *Used to compute amortization in Item 11.*

[5] *Specify source to include certification that funds are available, if financed from the regular budget:*

Page 3 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

23. SUMMARY OF SAVINGS *(MANPOWER AND DOLLARS)*

ITEMS	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR	TYPE PERS[6]	DOLLARS	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
a	b	c	d	e. FROM	f. TO	g. FROM	h. TO	i. FROM	j. TO
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS[7]									
(7) OTHER DOLLAR SAVINGS *(Excluding Manpower)*, e.g., CONTRACT COSTS & UTILITIES									
(8) Electricity			$27,300						
(9) #6 Fuel Oil			$114,800						
(10) Cover Replacements			($4,700)						
(11) TOTAL DOLLAR SAVINGS			$137,400						

[6] *(1) US Graded*
(2) US Wage Board
(3) DHFN
(4) IHFN
(5) Officer
(6) WO
(7) Enlisted

[7] *Reflect specific duties being performed with additional manhours available (equivalent manyears)*

Figure II–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

24. REGULATORY APPROVAL/COORDINATION		
a. INVESTMENT STATEMENT This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints. (Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)		
b. OTHER COORDINATION (Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)		
25. SUBMITTED BY (Typed name, grade and title of Subordinate Command/Agency or Project Initiator)	SIGNATURE	DATE (YYMMDD) AUTOVON
26. APPROVAL RECOMMENDED BY (MACOM/Agency)	SIGNATURE	DATE (YYMMDD) AUTOVON
FOR USE BY HQDA ON OSD PIF PROJECTS ONLY		
27. APPROVED BY	SIGNATURE	DATE (YYMMDD) AUTOVON
28. OTHER REMARKS (Cont'd)		

Page 5 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

ECO Number: 3

DIP TANK COVERS WITH EXHAUST FAN CONTROLS

Discussion

Noxious dip tank fumes are exhausted in accordance with OSHA guidelines to protect workers. Ventilation of the fumes is accomplished by drawing room air across the surface of the dip tank fluid, into an exhaust duct, through a ventilation fan and out through the roof to the atmosphere. The warm room air used to entrain the fumes must be replaced with outside air that must be heated. The exhausted air represents a significant heat loss.

The amount of exhausted air can be minimized by covering the dip tank and draft slot with a flexible, chemically resistant cover whenever the tank is not in use. With the cover in place, the fume evolution potential is sharply reduced, so the amount of exhaust air can also be reduced. The reduction in exhaust air represents substantial energy savings from both reduced warm air loss as well as from reduced exhaust fan power.

This ECO provides all vented dip tanks with a flexible, chemically resistant cover (like a tarpaulin) permanently fixed to each tank/vent-duct assembly. The cover can be extended or retracted by appropriate means ranging from manually rolling and unrolling to spring-assisted retraction, similar to the operation of a window shade (see Volume II for sketches). This ECO also provides for exhaust fan speed reduction whenever the covers are in place. The speed reduction will be accomplished by measuring and controlling a set pressure rise across the exhaust fan with a differential pressure sensor and controller which in turn will adjust the speed of the exhaust fan motor through a variable frequency drive. This fan speed control will be particularly effective in Buildings 1 and 370 where fans serve multiple tanks. With this control technique, the OSHA-mandated exhaust air flows can be maintained under all conditions of variable building pressure and variable tank use.

This approach to dip tank operation has been discussed with OSHA in Harrisburg, Pennsylvania, and determined to be acceptable.

Recommendation

Based on the Life Cycle Cost Analysis and a discussion with OSHA, it is recommended that flexible, chemically resistant dip tank covers be installed along with vent fan pressure differential controllers on the 29 vented dip tanks as noted in the Appendix.

Construction Cost	$188,590
Annual Energy Savings (MBtu/yr)	
Nos. 5 & 6 Oil	26,034
Electricity	2,496
Annual Energy Cost Savings ($/yr)	$142,100
Additional Maintenance	$4,700
SIR	10.0
Simple Payback (years)	1.5

LIFE CYCLE COST ANALYSIS SUMMARY — STUDY: ECO3
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) — LCCID 1.062
INSTALLATION & LOCATION: LETTERKENNY ADREGION NOS. 3 CENSUS: 1
PROJECT NO. & TITLE: ECO #3 DIP TANK COVERS
FISCAL YEAR 1992 DISCRETE PORTION NAME: TOTAL PROJECT
ANALYSIS DATE: 10-21-91 ECONOMIC LIFE 15 YEARS PREPARED BY: W. TODD

1. INVESTMENT

A. CONSTRUCTION COST	$ 188570.
B. SIOH	$ 10372.
C. DESIGN COST	$ 11315.
D. SALVAGE VALUE COST	-$ 0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	$ 210257.

2. ENERGY SAVINGS (+) / COST (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	$ 10.94	2496.	$ 27306.	10.75	293542.
B. DIST	$ 4.98	0.	$ 0.	14.08	0.
C. RESID	$ 4.41	26034.	$ 114810.	16.21	1861069.
D. NAT G	$ .00	0.	$ 0.	13.25	0.
E. COAL	$ .00	0.	$ 0.	11.13	0.
F. TOTAL		28530.	$ 142116.		$ 2154611.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)		$ -4700.
(1) DISCOUNT FACTOR (TABLE A)	10.59	
(2) DISCOUNTED SAVING/COST (3A X 3A1)		$ -49773.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)		$ -49773.

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 711022.
A IF 3D1 IS = OR > 3C GO TO ITEM 4
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)_____
C IF 3D1B IS = > 1 GO TO ITEM 4
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YRS ECONOMIC LIFE)) $ 137416.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 2104838.

6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 10.01
(IF < 1 PROJECT DOES NOT QUALIFY)

7. SIMPLE PAYBACK PERIOD (ESTIMATED) SPB=1F/4 1.53

RS-H

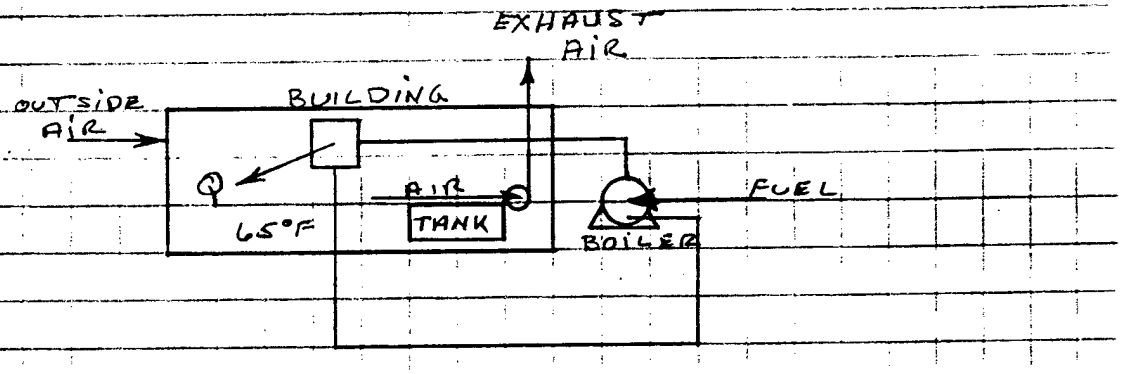
SUBJECT LETTERKENNY ERAP
ECO #3
DESIGNER G.F.
CHECKER

AEP NO 290-0379-001
SHEET 1 OF 4
DATE 3-21-91
DATE

ECO # 3 DIP TANK COVERS

ASSUMPTIONS:

1. ROOM TEMPERATURE = 68 °F
2. HEAT LOAD FACTOR (HLF)
   HLF$_1$ = 0.166 MBTU/yr·CFM (24 hr/d, 7 d/w)
   HLF$_2$ = 0.0742 MBTU/yr·CFM (16 hr/d, 5 d/w)
3. FAN EFFICIENCY = 0.5
4. STEAM GENERATION EFFICIENCY = 0.8
5. FAN ΔP = 3 IN. W.C.
6. LEAKAGE FLOW WITH COVER IN PLACE = 1% DESIGN FLOW



CURRENT ENERGY USE (TANK 4318, BLDG 37)

$$Q = \frac{\text{CFM} \times \text{HEAT LOSS FACTOR (MBTU/CFM YR)}}{\text{STEAM GEN. EFF}}$$

$$= \frac{5200 \times 0.166}{0.8} = 1079 \text{ MBTU/yr \#2 F.O.}$$

CURRENT FAN ENERGY USE

$$\text{FAN HP} \times \text{BTU/HP HR} \times 8760 \text{ HR/yr} \times \frac{\text{MBTU}}{10^6 \text{ BTU}} =$$

$$\frac{5200 \times 3}{6356 \times .5} \text{ HP} \times 2545 \text{ BTU/HP HR} \times 8760 \text{ HR/yr} \times \frac{1}{10^6} = 109 \text{ MBTU/yr ELECTRIC}$$

RS&H

SUBJECT LETTERKENNY EEAP

DESIGNER G. F.

CHECKER

AEP NO

SHEET 2 OF 4

DATE 3-21-91

DATE

ENERGY CONSUMPTION (W) COVER

(16-h/d, 5d/w) (8-h/d 5d/w + weekends)

Q = HEAT LOSS IN OPERATION + HEAT LOSS COVERED

$$= \frac{CFM \times HLF}{\eta} + \frac{(LEAKAGE\ CFM \times (HLF_1 - HLF_2))}{\eta}$$

$$= \frac{5200 \times 0.0742}{0.8} + \frac{52 \times (0.166 - 0.0742)}{0.8} = 488\ MBTU/yR$$

FAN ENERGY CONSUMPTION (W) COVER

NOTE: FAN Δ P CONTROLS WILL REDUCE FAN SPEED VIA A VARIABLE FREQUENCY DRIVE TO MAINTAIN SET ΔP WHEN COVER IS IN PLACE.

CONSUMPTION = ENERGY USE WHILE COVERED & UNCOVERED.

UNCOVERED CONSUMPTION

$$= CURRENT\ FAN\ USE \times \frac{UNCOVERED\ TIME}{TOTAL\ TIME}$$

$$= 109 \times \frac{4160}{8760} = 51.76\ MBTU\ ELEC/yR$$

COVERED CONSUMPTION

$$\frac{52 \times 3}{6356 \times .5}\ (HP) \times 2545\ \frac{BTU}{HP\ HR} \times (8760 - 3035)\ HRS/yR \times \frac{MBTU}{10^6\ BTU} = 0.715\ \frac{MBTU\ el}{yR}$$

TOTAL CONSUMPTION

TOTAL = COVERED + UNCOVERED

$$= 0.715 + 51.76 = 52.47\ \frac{MBTU\ elec}{yR}$$

RS&H

SUBJECT LETTERKENNY EEAP
AEP NO
SHEET 3 OF 4
DESIGNER G. F.
DATE 3/21/91
CHECKER
DATE

SAVINGS

FUEL OIL

SAVINGS = (CURRENT) − (W COVER)

= 1079, MBTU/YR − 488 MBTU/YR

= 591 MBTU/YR #2 FUEL OIL

ELECTRICITY

SAVINGS = (CURRENT) − (W COVER)

= 109 − 52.47

= 56.53 MBTU ELEC/YR

TOTAL DEPOT

ASSUMPTIONS:

1) ALL TANK FANS OPERATE CONTINUOUSLY AT DESIGN FLOW (PER OSHA REQUIREMENTS)
2) TANKS ARE "USED" 2 SHIFTS/day, 5 d/w, 52 w/yr

APPROACH: 1) CALCULATE UNIT HEAT SAVING FACTOR FROM SINGLE TANK PROCEDURE ABOVE
2) APPLY FACTORS TO ALL OTHER TANKS
3) SUM RESULTS FOR TOTAL FACILITY.

UNIT HEAT SAVING FACTOR = HEAT SAVED / CFM

UHSF = 591 MBTU/YR / 5200 CFM = 0.1137 MBTU/CFM YR

RS&H

SUBJECT LETTERKENNY EEAP

DESIGNER G. F.

CHECKER

AEP NO

SHEET 4 OF 4

DATE 3-21-91

DATE

UNIT ELECTRICITY SAVING FACTOR = $\frac{\text{ELECTRIC ENERGY SAVED}}{\text{CFM}}$

$$UESF = \frac{56.55 \text{ MBTU ELEC/YR}}{5200 \text{ CFM}} = 0.0109 \frac{\text{MBTU ELEC}}{\text{CFM YR.}}$$

APPLYING THESE FACTORS TO EACH VENTED TANK (SEE ENCLOSED SPREADSHEET CALCULATION) YIELDS:

TOTAL FACILITY HEAT SAVED = Σ INDIVIDUAL TANKS.

= 26,034 MBTU FUEL/YR

TOTAL FACILITY ELEC ENERGY SAVED = Σ INDIVIDUAL TANKS

= 2,496 $\frac{\text{MBTU ELEC}}{\text{YR.}}$

LETTERKENNY ARMY DEPOT
DIP TANK COVER
SUMMARY

	Building Number	Tank ID	Design Ventil. (cfm)	Common or Dedicated Fan (D)-(C)	Annual FUEL(5& 6)Saved (Mbtu)	Value of Saved Energy ($/yr)	Annual Electric Saved (Mbtu)	Value of Saved Ele Energy ($/yr)	Total Cost Savings ($/yr)	Const. Cost* ($)	Payback (Yrs)
	1N	2861-1	10,000	D	1,137	$5,014	109	$1,192	$6,207	$9,148	1.5
		2861-2	3,750	C	426	$1,880	41	$447	$2,327	$1,438	0.6
		2861-3	7,500	C	853	$3,761	82	$894	$4,655	$1,438	0.3
		2861-4	7,500	C	853	$3,761	82	$894	$4,655	$1,438	0.3
		2861-5	7,500	C	853	$3,761	82	$894	$4,655	$1,438	0.3
		2861-6	7,500	D	853	$3,761	82	$894	$4,655	$9,148	2.0
		2861-7	7,500	C	853	$3,761	82	$894	$4,655	$1,438	0.3
		2861-8	7,500	C	853	$3,761	82	$894	$4,655	$1,438	0.3
		400	3,060	C	348	$1,534	33	$365	$1,899	$1,438	0.8
		402	4,500	D	512	$2,256	49	$537	$2,793	$9,148	3.3
		378	4,500	C	512	$2,256	49	$537	$2,793	$1,438	0.5
		377	4,500	C	512	$2,256	49	$537	$2,793	$1,438	0.5
		4577	1,560	C	177	$782	17	$186	$968	$1,438	1.5
		4741	4,050	C	460	$2,031	44	$483	$2,514	$1,438	0.6
Subtotal	1N	14	80,920	3	9,201	$40,575	882	$9,649	$50,224	$43,262	0.9
	37	2568	6,800	D	773	$3,410	74	$811	$4,221	$9,148	2.2
		4318	5,200	D	591	$2,607	57	$620	$3,227	$9,148	2.8
		4319	9,600	D	1,092	$4,814	105	$1,145	$5,958	$9,148	1.5
		4193	6,000	D	682	$3,009	65	$715	$3,724	$9,148	2.5
Subtotal	37	4	27,600	4	3,138	$13,839	301	$3,291	$17,130	$36,592	2.1
	350N	2514	9,360	D	1,064	$4,693	102	$1,116	$5,809	$9,148	1.6
		2516	6,480	D	737	$3,249	71	$773	$4,022	$9,148	2.3
		2518	9,360	D	1,064	$4,693	102	$1,116	$5,809	$9,148	1.6
		2520	12,600	D	1,433	$6,318	137	$1,502	$7,820	$9,148	1.2
		2744	5,500	D	625	$2,758	60	$656	$3,414	$9,148	2.7
		1479	3,600	D	409	$1,805	39	$429	$2,234	$9,148	4.1
		1480	6,860	D	780	$3,440	75	$818	$4,258	$9,148	2.1
		2606	993	D	113	$498	11	$118	$616	$9,148	14.8
	350S	2531	12,000	D	1,364	$6,017	131	$1,431	$7,448	$9,148	1.2
		2536	11,000	D	1,251	$5,516	120	$1,312	$6,827	$9,148	1.3
		2539	2,500	D	284	$1,254	27	$298	$1,552	$9,148	5.9
Subtotal	350	11	80,253	11	9,125	$40,240	875	$9,570	$49,810	$100,628	2.0

LETTERKENNY ARMY DEPOT
DIP TANK COVER
SUMMARY

Building Number	Tank ID	Design Ventil. (cfm)	Common or Dedicated Fan (D)-(C)	Annual FUEL(5& 6)Saved (Mbtu)	Value of Saved Energy ($/yr)	Annual Electric Saved (Mbtu)	Value of Saved Ele Energy ($/yr)	Total Cost Savings ($/yr)	Const. Cost* ($)	Payback (Yrs)
370	T-1	3,800	C	432	$1,905	41	$453	$2,359	$1,438	0.6
	T-2	2,700	C	307	$1,354	29	$322	$1,676	$1,438	0.9
	T-3	5,700	D	648	$2,858	62	$680	$3,538	$9,148	2.6
	T-4	5,700	C	648	$2,858	62	$680	$3,538	$1,438	0.4
	T-5	3,600	C	409	$1,805	39	$429	$2,234	$1,438	0.6
	T-6	2,700	C	307	$1,354	29	$322	$1,676	$1,438	0.9
	T-7	5,700	D	648	$2,858	62	$680	$3,538	$9,148	2.6
	T-8	3,800	C	432	$1,905	41	$453	$2,359	$1,438	0.6
	T-9	2,700	C	307	$1,354	29	$322	$1,676	$1,438	0.9
	T-10	3,800	C	432	$1,905	41	$453	$2,359	$1,438	0.6
Subtotal	370	10	40,200	2	4,571	$20,157	438	$4,794	$24,951	$29,800	1.2
Total	4	39	228,973	20	26,034	$114,811	2,496	$27,304	$142,115	$210,282	1.5

* Costs for differential pressure controls and VF drives are not distributed over tanks sharing a common fan.

QRIP Calc using FY 92 Fuel Oil Prices

Current energy use:

$$Elec = Fan\ Hp * Btu/Hp * 3760\ hr/yr * \frac{1\ MBtu}{10^6\ MBtu} * 10.94\ \$/MBtu$$

$$Fan\ Hr = \frac{cfm\ \Delta P}{6356\ \eta_{fan}}$$

$$= \frac{(228,973)(2)}{(6356)(0.5)} * 2545\ \frac{Btu}{Hp\ Hr} * 8760 * \frac{10.94\ \$/MBtu}{10^6} = \$52,700/yr.$$

$$Fuel\ Oil = cfm * HLF \div \eta_{blr} = 228,973 * 0.166 \div 0.8 = 47,512\ MBtu/yr$$

$$47,512 * 4.41\ \$/MBtu = \$209,500/yr$$

TOTAL COSTS = $262,200/yr

05/09/91

ECO Construction Cost Estimate Calculations

ECO Name: Dip Tank Cover

ECO #: 3

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$4,400
Labor	$960
Subtotal bare costs	$5,360
FICA Insurance (20% of Labor)	$192
Sales Tax (6.5% of Material)	$286
Subtotal	$5,838
Overhead (15%)	$876
Subtotal	$6,714
Profit (10%)	$671
Subtotal	$7,385
Bond (1%)	$74
Subtotal	$7,459
Contingency (10%)	$746
Subtotal (Construction Cost Input For LCCID *)	$8,205
SIOH (5.5% of Construction Cost)	$451
Subtotal	$8,656
Design (6% of Construction Cost)	$492
Total Project Cost	$9,148

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

05/09/91

ECO Construction Cost Estimate Calculations

ECO Name: Dip Tank Covers w/o Controls

ECO #: 3

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$500
Labor	$320
Subtotal bare costs	$820
FICA Insurance (20% of Labor)	$64
Sales Tax (6.5% of Material)	$33
Subtotal	$917
Overhead (15%)	$138
Subtotal	$1,055
Profit (10%)	$106
Subtotal	$1,161
Bond (1%)	$12
Subtotal	$1,173
Contingency (10%)	$117
Subtotal (Construction Cost Input For LCCID *)	$1,290
SIOH (5.5% of Construction Cost)	$71
Subtotal	$1,361
Design (6% of Construction Cost)	$77
Total Project Cost	$1,438

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

09/26/91

ECO Construction Cost Estimate
Calculations

ECO Name: Dip Tank Covers

ECO #: 3

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$97,500
Labor	$25,280
Subtotal bare costs	$122,780
FICA Insurance (20% of Labor)	$5,056
Sales Tax (6.5% of Material)	$6,338
Subtotal	$134,174
Overhead (15%)	$20,126
Subtotal	$154,300
Profit (10%)	$15,430
Subtotal	$169,730
Bond (1%)	$1,697
Subtotal	$171,427
Contingency (10%)	$17,143
Subtotal (Construction Cost Input For LCCID *)	$188,570
SIOH (5.5% of Construction Cost)	$10,371
Subtotal	$198,941
Design (6% of Construction Cost)	$11,314
Total Project Cost	$210,255

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

For QRIP

Covers represent 26% of project cost => $\frac{31980}{122,780} = 0.26$ (p. 3-9)

Therefore $210,257 * 0.26 = \$54,765$

RS&H®

SUBJECT ECO #3 AEP NO 290-0379-001

SHEET ____ OF ____

DESIGNER P. Hutchins DATE ____

CHECKER ____ DATE ____

Additional maintenance costs

Covers will last about 5 years

Therefore, covers will be replaced 3 times over the 15 year project life

For LCCID 1/5 of 39 covers will be replaced annually

1/5 * $600 * 39 = $4700

CONSTRUCTION COST ESTIMATE	DATE PREPARED	SHEET OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION: LEAD

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE
- ☐ CODE A (No design completed)
- ☐ CODE B (Preliminary design)
- ☐ CODE C (Final design)
- ☐ OTHER (Specify) _____

DRAWING NO.

ESTIMATOR: G. FALLON

CHECKED BY: P. Hutchins

TANK COVER & FAN CONTROLLER SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR PER UNIT	LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
DIP TANK COVER	39	EA	320	12,480	500	19,500	31,980
(w) MOVEABLE MOUNT.							
FAN PRESSURE							
XMITTER	20	EA	160	3,200	550	11,000	14,200
CONTROLLER	20	EA	160	3,200	550	11,000	14,200
FAN MOTOR VARI.							
FREQ. DRIVE	20	EA	320	6,400	2800	56,000	62,400
				25,280		97,500	122,780
For QRIP Covers represent				131980	-	26% of	project costs
				122,780			

ENG FORM 150
1 AUG 59

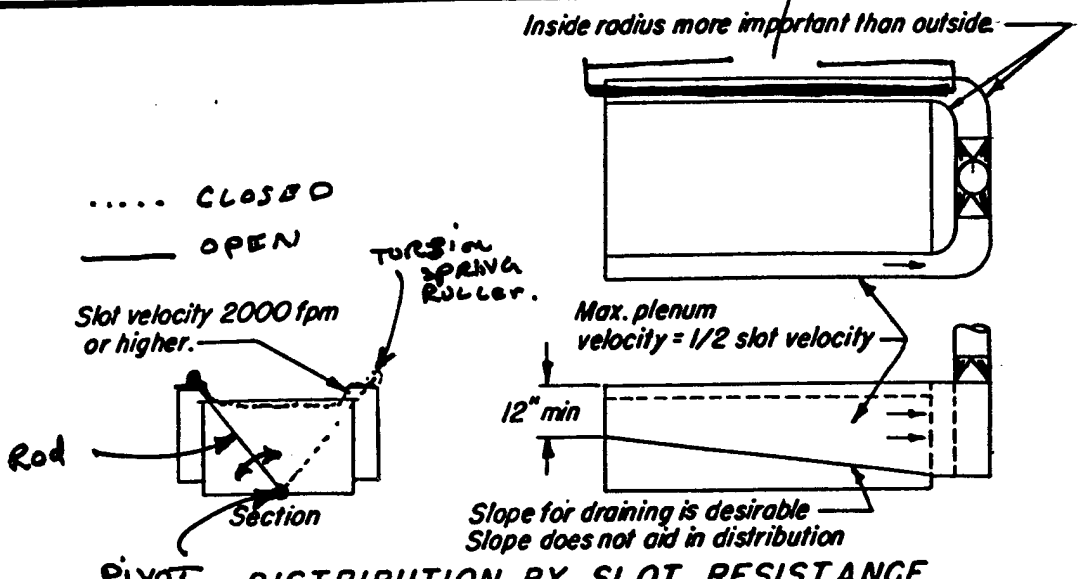
(ER 1110-345-730)

PREVIOUS EDITION MAY BE USED

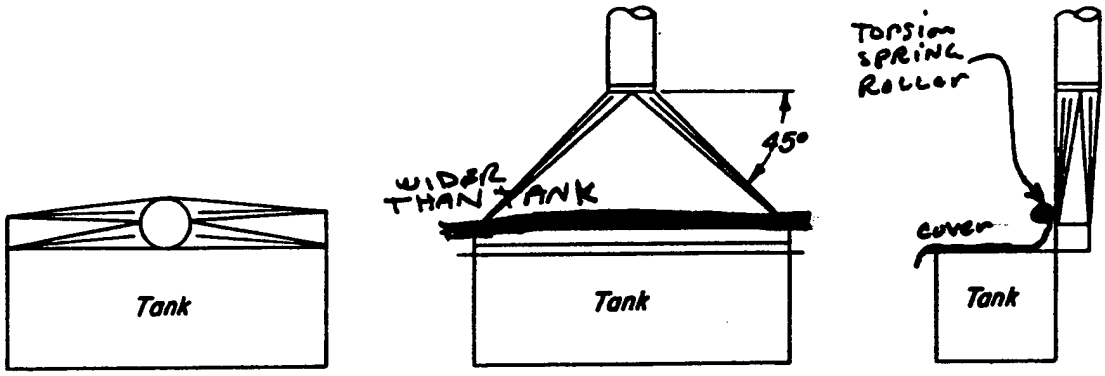
* U.S. GOVERNMENT PRINTING OFFICE : 1958 O—516160

(TRANSLUCENT)

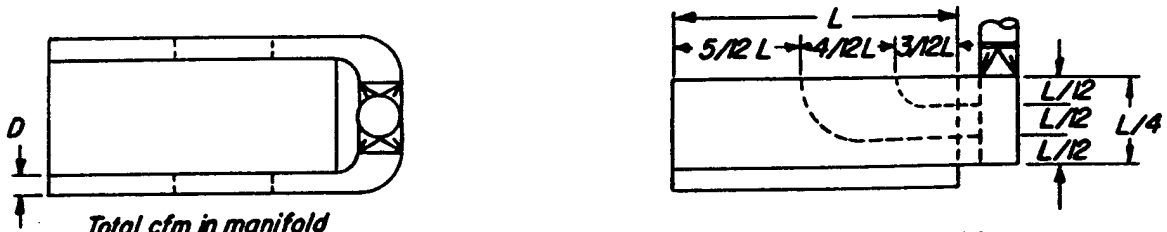
WIDER THAN TANK TO ALLOW OVERHANG



DISTRIBUTION BY SLOT RESISTANCE



DISTRIBUTION BY FISH TAIL



$D = \frac{\text{Total cfm in manifold}}{500 \times L}$

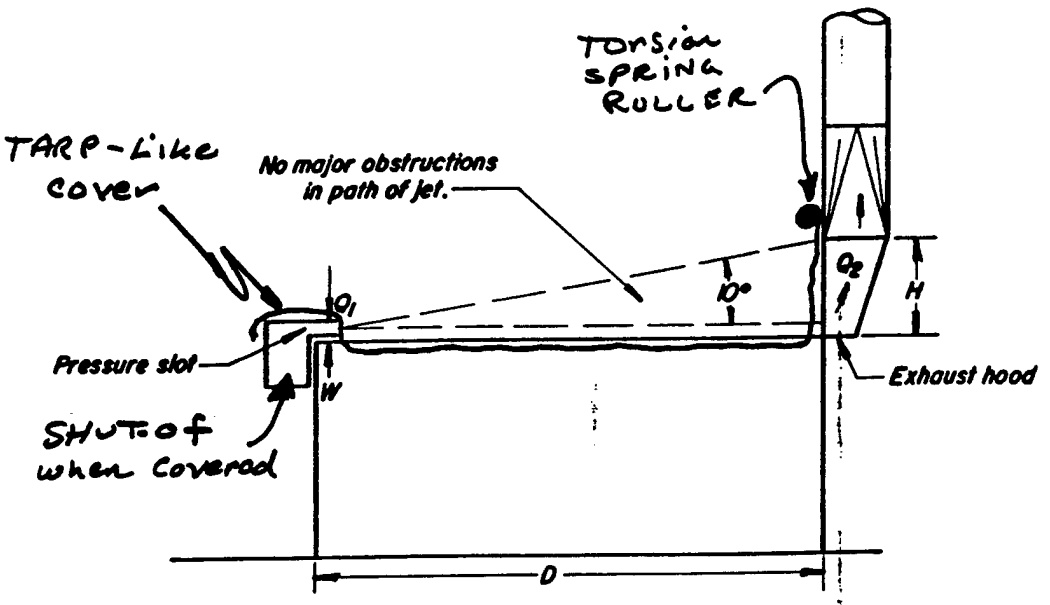
DISTRIBUTION BY SPLITTER VANES

With low plenum velocities and high slot velocities, good distribution is obtained. If this design is not possible, splitter vanes should be used. Slots over 10 feet to 12 feet in length usually need multiple take-offs.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS

PRINCIPLES OF MANIFOLD DESIGI

DATE 1-70 | Fig. 4-12



PUSH PULL HOODS

Exhaust Hood

Quantity of air exhausted,
Q_2 = 100 to 150 cfm /sq. ft. of tank area, depending on temperature of liquid, cross drafts, agitation, etc.

Hood height should be,
$H = D \times \tan 10°$.
$= 0.18D$

Pressure Slot

Quantity of air supplied,

$$Q_1 = \frac{1}{D \times E} \times Q_2$$

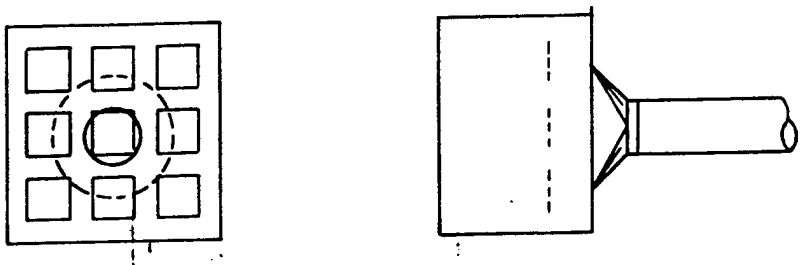
where; D = length of throw, feet
E = entrainment factor.

Throw length, D, feet	Entrainment factor, E
0 - 8	2.0
8 - 16	1.4
16 - 24	1.0
over 24	0.7

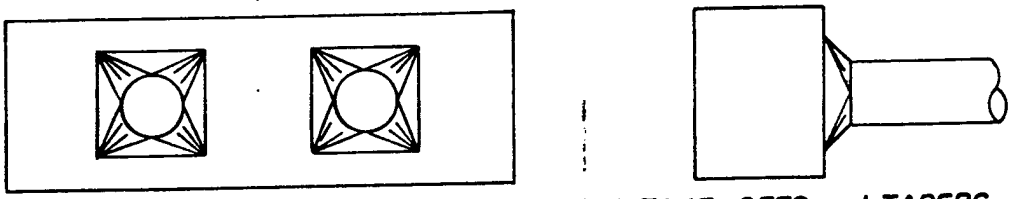
Slot width W should be designed for a velocity of 1000 to 2000 fpm.

Design such systems so they can be easily modified or adjusted to obtain desired results.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS	
HOOD DESIGN DATA	
DATE 1-64	Fig. 4-17

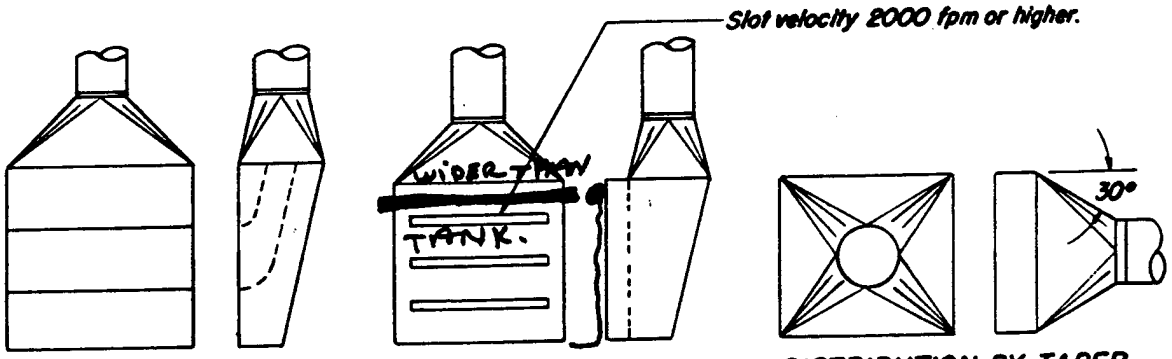


DISTRIBUTION BY BAFFLES
See Fig. 4-16



LONG BOOTHS - DISTRIBUTION BY MULTIPLE TAKE-OFFS and TAPERS

BOOTH-TYPE HOODS
(Same principle apply to canopy type)



DISTRIBUTION BY SPLITTER VANES

DISTRIBUTION BY SLOT (or baffles)

DISTRIBUTION BY TAPER

SIDE-DRAFT & SUSPENDED HOODS

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS	
PRINCIPLES OF MANIFOLD DESIGN	
DATE 1-64	Fig. 4-13

THE KING OF TARPAULINS
GOSPORT MANUFACTURING COMPANY, INC.

DUNS: 04-698-0644
TELEPHONE: 812/879-4224
OUT OF STATE: 800/457-4406
FAX: 812/879-4227
11 LOUSISA STREET, P.O. BOX #26, GOSPORT, INDIANA 47433

March 15, 1991

REYNOLDS, SMITH & HILLS
4651 SALISBURY ROAD
JACKSONVILLE, FL 32256
ATTN: GEORGE FALLEN

Dear George:

Please find the information that I have enclosed for you per our recent phone conversation.

You can be assured that Gosport Manufacturing Company will provide you with the best in quality and excellent service in meeting your tarpaulin needs. Not only do we offer quality, 100% American made products, we stand behind everything we make.

If I can be of any service, or if you have any questions, please do not hesitate to call me at **800-457-4406.** Thank you for your consideration!

Looking forward to doing business with you!

Sincerely,

David S. Daubenheyer

David S. Daubenheyer
Account Executive

DSD/mg

Enclosures

TARPAULINS

NAME	CATALOG PAGE	ORDER NUMBER	WEIGHT	DESCRIPTION	COLOR	PRICE (per sq. ft.)
CANVAS TARPS*						
Noble	4	TCN08	8 oz.	1½" hem	Drab, Brown	24¢
Noble	4	TCN10	10 oz.	1½" hem	Drab, Brown	25¢
Noble	4	TCN12	12 oz.	1½" hem	Drab, Brown	27¢
Noble	4	TCN15	14.9 oz.	1½" hem	Drab, Brown	32¢
Royal	3	TCR08	8 oz.	Reinforced patches, brass grommets	Drab, Brown	25¢
Royal	3	TCR10	10 oz.	Reinforced patches, brass grommets	Drab, Brown	29¢
Royal	3	TCR12	12 oz.	Reinforced patches, brass grommets	Drab, Brown	29¢
Royal	3	TCR15	14.9 oz.	Reinforced patches, brass grommets	Drab, Brown	33¢
Majestic	4	TCM08	8 oz.	Rope-in-hem, two rows of stitching	Drab, Brown	25¢
Majestic	4	TCM10	10 oz.	Rope-in-hem, two rows of stitching	Drab, Brown	29¢
Majestic	4	TCM12	12 oz.	Rope-in-hem, two rows of stitching	Drab, Brown	29¢
Majestic	4	TCM15	14.9 oz.	Rope-in-hem, two rows of stitching	Drab, Brown	33¢
Regal	3	TCG08	8 oz.	D-rings, reinforced patches, rope-in-hem	Drab, Brown	29¢
Regal	3	TCG10	10 oz.	D-rings, reinforced patches, rope-in-hem	Drab, Brown	27¢
Regal	3	TCG12	12 oz.	D-rings, reinforced patches, rope-in-hem	Drab, Brown	29¢
Regal	3	TCG15	14.9 oz.	D-rings, reinforced patches, rope-in-hem	Drab, Brown	34¢
VINYL TARPS						
Neoprene	5	TVN16	16 oz.	Extra durable material	Black	57¢
Lightweight	5	TVL10	10 oz.	Flame resistant treated	Grn, Red, Blu	24¢
Laminated	5	TVL14	14 oz.	Flame resistant treated	Grn, Red, Blu	40¢
Coated	5	TVC18	18 oz.	Tear and puncture resistant	Large variety	47¢
Coated	5	TVC22	22 oz.	Tear and puncture resistant	Large variety	52¢
POLYETHYLENE TARPS						
Ultrastrong	8	TPU		D-rings, reinforced patches, rope-in-hem	Blue	19¢
All-American	8	TPA		Rope-in-hem, two rows of stitching (Orders less than $100, 9.5¢ per sq. ft.)	Blue	8.5¢
Poly Tarp	10	TP08FR		8 x 9, flame resistant	Opaque	14¢
Poly Tarp	10	TP10D4		10 x D4	White/White	9¢
Poly Tarp	10	TP1212		12 x 12	Black/White	19¢
Poly Tarp	10	TP08UV		8 x 9, UV resistant	White/White	13¢
Poly Tarp	10	TP1010		10 x 10	Silver	13¢
Poly-Star Tarps in Poly-Star Section						
INFLATION FIGHTER TARPS						
	9	TIF10	10 oz.	Made from piece goods, fabric varies	Varies	22¢
	9	TIF12	12 oz.	Made from piece goods, fabric varies	Varies	23.5¢
DRY FINISH TARPS						
	9	TDF10	10 oz.	No rub off or discoloration damage	Pearl B	26¢
	9	TDF10S	10.3 oz.	Army Duck, no rub off damage	Pearl B	37¢

COVERS

NAME	CATALOG PAGE	ORDER NUMBER	WEIGHT	DESCRIPTION	COLOR	PRICE (per sq. ft.)
SWIMMING POOL COVERS						
Royal	9	CVPR10	10 oz.	Vinyl laminated, reinforced patches & webbing	Grn, Red, Blu	37¢
Royal	9	CVPR14	14 oz.	Vinyl laminated, reinforced patches & webbing	Grn, Red, Blu	44¢
American	9	CPPAL		Light weight poly, reinforced patches & webbing	Blue	13¢
American	9	CPPAH		Heavy weight poly, reinforced patches & webbing	Blue	23¢
Net	9	CNP		Reinforced patches & webbing	Multi-color	26¢

*Commercial Canvas Flame Resistant, add 5¢ per square foot.

COVERS

NAME	CATALOG PAGE	ORDER NUMBER	WEIGHT	DESCRIPTION	COLOR	PRICE (per sq. ft.)
CAR COVERS						
A	11	CDC-A		Poly-cotton blend, elastic & tie downs	Pearl Green	$54.99 set
B	11	CDC-B		Poly-cotton blend, elastic & tie downs	Pearl Green	$61.99 set
C	11	CDC-C		Poly-cotton blend, elastic & tie downs	Pearl Green	$67.99 set
D	11	CDC-D		Poly-cotton blend, elastic & tie downs	Pearl Green	$72.99 set
E	11	CDC-E		Poly-cotton blend, elastic & tie downs	Pearl Green	$77.99 set
F	11	CDC-F		Poly-cotton blend, elastic & tie downs	Pearl Green	$84.99 set
Bag	11	MCSB		Car cover storage bag		$3.95 set
TRUCK COVERS						
Net	6	CNTT		Top grade PVC coated poly net, 2" hems	Grn, Blu, Blk Multi-color	24¢
Net	6	CNTE		Economy grade, 1¼" hem	Varies	20¢
Steel Hauler	6	CCH12	12 oz.	Cotton Duck, D-rings set into cove bands	Drab, Brown	39¢
Steel Hauler	6	CCH15	14.9 oz.	Cotton Duck, D-rings set into cove bands	Drab, Brown	44¢
Steel Hauler	6	CVH18	18 oz.	Vinyl coated nylon, D-rings set into cove bands	Large variety	52¢
GYM COVERS						
Canvas	13	CCG10	10 oz.	Flame resistant, meets state school fire codes	Tan	Quote
Vinyl	13	CVG10	10 oz.	Completely waterproof & flame resistant Meets state school fire codes	Large variety	Quote
FIELD COVERS						
Polyethylene	13	CPF		Completely waterproof, high UV treated	Blue	Quote
Vinyl	13	CVF10	10 oz.	Durable cover, completely waterproof	Large variety	Quote
Vinyl	13	CVF14	14 oz.	Durable cover, completely waterproof	Large variety	Quote
SALVAGE COVERS						
Canvas	10	CCS12	12 oz.	Triple-thick hem		36¢
Canvas Duck	10	CCSD	#12	Triple-thick hem		44¢
Dry Finish	10	CDS10	10.36 oz.	Triple-thick hem, no rub off damage	Pearl B	45¢
Dry Finish	10	CDS13	13 oz.	Triple-thick hem, no rub off damage	Pearl B	49¢
Vinyl	10	CVS10	10 oz.	Vinyl laminated nylon, triple-thick hem	Red, Green	40¢
Vinyl	10	CVS14	14 oz.	Vinyl laminated nylon, triple-thick hem	Red, Green	45¢

BOAT COVERS

NAME	CATALOG PAGE	ORDER NUMBER	WEIGHT	DESIGNED FOR	BOAT LENGTH (Feet)	BEAM WIDTH (Inches)	STOCK NUMBER	OUTBOARD STOCK NUMBER	NET PRICE
Standard	12	CDBS14	8 oz.	V-Hull	14	68	RF-14		$68.95
Standard	12	CDBS15	8 oz.	V-Hull	15	76	RF-15		$69.95
Standard	12	CDBS16	8 oz.	V-Hull	16	76	RF-16		$69.95
Standard	12	CDBS17	8 oz.	V-Hull	17	80	RF-17		$69.95
Standard	12	CDBS18	8 oz.	V-Hull	18	86	RF-18		$72.95
Deluxe	12	CDBD14	10.5 oz.	V-Hull	14	68	DRF-14		$83.95
Deluxe	12	CDBD15	10.5 oz.	V-Hull	15	76	DRF-15		$87.95
Deluxe	12	CDBD16	10.5 oz.	V-Hull	16	76	DRF-16		$88.95
Deluxe	12	CDBD17	10.5 oz.	V-Hull	17	80	DRF-17		$88.95
Deluxe	12	CDBD18	10.5 oz.	V-Hull	18	86	DRF-18		$97.95
Tri-Hull	12	CDBT15	10.5 oz.	Cathedral Hulls	15	75	RI/O-15	RO-15	$91.95
Tri-Hull	12	CDBT16	10.5 oz.	Cathedral Hulls	16	80	RI/O-16	RO-16	$92.95
Tri-Hull	12	CDBT17	10.5 oz.	Cathedral Hulls	17	82	RI/O-17	RO-17	$96.95
Tri-Hull	12	CDBT18	10.5 oz.	Cathedral Hulls	18	86	RI/O-18	RO-18	$97.95

Telephone Call Confirmation

reynolds, smith and hills

Project No. _____

Local _____ L.D. X Placed _____ Rec'd X Date 3-21-91

G. FALLON S.W.F. Conversed with BOB FINK (717) 782-3902

Of OSHA HARRISBURG, PA. Regarding DIP TANK COVERS.

G.F. EXPLAINED FLEXIBLE DIP TANK COVERS WITH FAN ΔP CONTROLS.

B.F. ADVISED THAT OSHA HAS VERY SPECIFIC REGULATIONS RE: minimum DIP TANK AIR FLOW REQUIREMENTS AIMED AT PROTECTING WORKERS from ON THE JOB HAZARDS.

ALTHOUGH REDUCING THE AIR FLOW WOULD BE A "TECHNICAL" VIOLATION, NO CITATION WOULD BE ISSUED AS LONG AS THERE WAS NO HAZARD TO THE WORKER.

HE FELT THAT AS LONG AS THE FANS were drawing AIR FROM THE CAVITY BETWEEN THE COVER AND THE FLUID THAT ANY EVOLVED FUMES WOULD STILL BE EXHAUSTED.

NOTE: MR FINK ADVISED THAT DIP TANK VENT FANS SHOULD BE OPERATED AT ALL TIMES (24 HRS/day) AS A GENERAL RULE. THIS WAS ECHOED BY LEAD Hygienists.

Distribution:

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS
For use of this form, see AR 5-4; the proponent agency is OCA.

1. PROJECT NO.: AMC OSD PIF

REQUIREMENT CONTROL SYMBOL DD-M(R) 1561

2. TO:
HQ DA
Attn: DACS-DME
Pentagon
Washington, DC 20310-2070

3. THRU:
US AMC
Attn: AMCMM-M
5001 Eisenhower Ave
Alexandria, VA 22303-0001

4. FROM:
Commander
US DESCOM
Attn: AMSDS-RM-P
Chambersburg, PA 17201-4170

5. DOD COMP NAME: Army

6. DOD COMP CODE: A

7. COMMAND CODE: W73QKK

8. DATE: 10/9/91

9. PROJECT TITLE: Drive-In Paint Booth Air Flow Control

10. TYPE OF PROJECT (Check one): ☐ QRIP ☒ OSD PIF ☐ PECIP

11. AMORTIZATION YEARS/MONTHS: $ 237,128 (Project Cost) ÷ 64,100 (Average Annual Savings) X 12 (No. Mos) = 3.7 (years) or - (months) (amortization)

12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR: 024

13. ECONOMIC LIFE: 15

14. EXPECTED OPERATIONAL DATE:

15. SUBMITTING UNIT(S):
Commander
Letterkenny Army Depot
Attn: SDSLE-EM (T. Hagie)
Bldg. 663
Chambersburg, PA 17201-4150

16. UNIT ID CODE:

17. PROJECT DESCRIPTION:
Speed controllers are used on exhaust and supply fans to maintain correct ventilation rates under varying conditions and minimize flow during unoccupied times.

18. DETAILED JUSTIFICATION:
Supply and exhaust fans operate continuously during work shifts for convenience and to keep back flow due to building negative pressure. This project would allow fans to throttle back and save energy when booths are unoccupied, but not allow back flow of outside air.

19. SAVINGS DISPOSITION:
Savings are used to reduce energy expenditures

20. OTHER REMARKS (Continue on page 5, if more space is needed)

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

21a. SUMMARY OF DOLLAR SAVINGS
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY *(Identify)* Elec. & fue oil	$261,800	$197,700	$197,700	$197,700	$197,700	$64,100	$64,100	$64,100	$64,100
CONTRACT COSTS									
OTHER *(Identify)* _____									
TOTALS	$261,800	$197,700	$197,400	$197,700	$197,700	$64,100	$64,100	$64,100	$64,100

b. PRIORITIZATION

(1) INTERNAL RATE OF RETURN *(IRR)*

Divide estimated project cost 237,128 by average annual savings 64,100 = 3.7 factor.

Based on factor and number of years economic life of the project, select the IRR from Table H-3, App H, Ch. 5, AR 5-4 = 30 % IRR.

(2) SAVINGS TO INVESTMENT RATIO *(S/I)*

Multiply annual savings 64,100 X discount factor 7.98 = 511,500 and divide by present value of investment *(undiscounted)* 237,128 = 2.2 S/I.

(Based on economic life 15 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) RATE OF INVESTMENT PER MANPOWER SPACE *(RIMS)* N/A

Divide estimated project cost _____ by number of manpower space savings _____ = _____ RIMS.

(Manpower requivalents cannot be used in this computation.)

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)—Continued.

22. COST FOR PROJECT TO BECOME OPERATIONAL

EQUIPMENT TYPE a	PROPOSED SOURCE OF PROCUREMENT b	UNIT PRICE c	QUANTITY d	TOTAL COST e	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT f	FY FUNDS REQUIRED g
(1) Variable-Speed Controls and Devices	-	$5,928	40	$237,128		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION (Equipment delivery)						
(7) EQUIPMENT MODIFICATION[1]						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT[2]						
(10) FACILITIES MODIFICATION[3]						
(11) TRAINING						
(12) OTHER (Specify):						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL[4]				$237,128		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				$237,128		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE[5]				-		
(16) TOTAL (Sum of (14) + (15) above)				$237,128		

[1] *Not to exceed 10% of equipment cost for QRIP projects.*

[2] *Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.*

[3] *Normally not OPA funded.*

[4] *Used to compute amortization in Item 11.*

[5] *Specify source to include certification that funds are available, if financed from the regular budget:*

Page 3 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

23. SUMMARY OF SAVINGS *(MANPOWER AND DOLLARS)*

ITEMS	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR	TYPE PERS[6]	DOLLARS	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
a	b	c	d	e. FROM	f. TO	g. FROM	h. TO	i. FROM	j. TO
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS[7]									
(7) OTHER DOLLAR SAVINGS *(Excluding Manpower)*, e.g., CONTRACT COSTS & UTILITIES									
(8) Electricity			$16,400						
(9) #2 Fuel Oil			$28,300						
(10) #6 Fuel Oil			$19,400						
(11) TOTAL DOLLAR SAVINGS			$64,100						

[6] *(1) US Graded*
(2) US Wage Board
(3) DHFN
(4) IHFN
(5) Officer
(6) WO
(7) Enlisted

[7] *Reflect specific duties being performed with additional manhours available (equivalent manyears)*

Page 4 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)—Continued.

24. REGULATORY APPROVAL/COORDINATION

a. INVESTMENT STATEMENT

This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints.

(Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)

b. OTHER COORDINATION *(Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)*

25. SUBMITTED BY *(Typed name, grade and title of Subordinate Command/Agency or Project Initiator)*	SIGNATURE	DATE *(YYMMDD)* AUTOVON
26. APPROVAL RECOMMENDED BY *(MACOM/Agency)*	SIGNATURE	DATE *(YYMMDD)* AUTOVON

FOR USE BY HQDA ON OSD PIF PROJECTS ONLY

27. APPROVED BY	SIGNATURE	DATE *(YYMMDD)* AUTOVON

20. OTHER REMARKS *(Cont'd)*

Page 5 of DA Form 5108-R

Figure H–1. Documentation for Productivity Capital Investment Program (DA Form 5108–R)—Continued.

ECO Number: 10

DRIVE-IN PAINT BOOTH AIR FLOW CONTROL

Discussion

The two paint booths in Building 350 and the eight in Building 320 are large enough to enclose large tracked and wheeled vehicles. Supply air fans move outside air across a steam coil and into the paint booth. The exhaust fans draw air and fumes from the booth and discharge them to the atmosphere. Because of the variable pressure drops caused by the filters and the unsteady building negative pressure, the fans are hard to balance. This imbalance sometimes causes low air flows, a violation of OSHA regulations, and positive booth pressure which releases paint fumes into the building, a fire hazard. Additionally, the fans are allowed to operate at all times, even though no painting is being done because, while running, they prevent cold air from being drawn back into the booth by the negative pressure in the building. During the winter this back flow would allow cold air to blow on a freshly painted vehicle potentially ruining the paint job, and making the surroundings uncomfortably cold.

The recommended controls would solve all of these problems. Both supply and exhaust air fans are supplied with variable frequency (variable speed) drives and analog control loops. The supply air fans would supply the required flow, and the exhaust fans would maintain the required negative pressure. The supply air fan would supply the required air flow even if the filters get a little plugged, or if the building pressure were to change. Likewise, the exhaust fan would remove just enough air to keep the booth under a slightly negative pressure relative to the building interior. When painting is stopped, and the booth doors opened, the fans (supply and exhaust) would reduce speed to minimize backdraft air flow. Furthermore, in a manual mode, the controls will allow accelerated warm-up of cold vehicles inside the booth. This would liberate the valuable floor space in Building 350, now used for this purpose, for other, more productive activities.

The recommended fan controls optimize booth air flow and pressure while painting is under way and reduces air flow to a minimum when there are no

painting activities. These controls will save energy through reduced electrical consumption and reduced fuel consumption.

Recommendations

Based on the Life Cycle Cost Analysis, this project is recommended.

Construction Cost	$212,670
Annual Energy Savings (MBtu/yr)	
Electricity	1,503
No. 6 Fuel Oil	4,397
No. 2 Fuel Oil	5,674
Annual Energy Cost Savings ($/yr)	$64,100
SIR	3.8
Simple Payback (years)	3.7

LIFE CYCLE COST ANALYSIS SUMMARY — STUDY: ECO10
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) — LCCID 1.062
INSTALLATION & LOCATION: LETTERKENNY ADREGION NOS. 3 CENSUS: 1
PROJECT NO. & TITLE: ECO #10 PAINT BOOTH AIR FLOW CONTROL
FISCAL YEAR 1992 DISCRETE PORTION NAME: TOTAL PROJECT
ANALYSIS DATE: 10-14-91 ECONOMIC LIFE 15 YEARS PREPARED BY: G. FALLON

1. INVESTMENT

A. CONSTRUCTION COST	$ 212670.
B. SIOH	$ 11697.
C. DESIGN COST	$ 12761.
D. SALVAGE VALUE COST	-$ 0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	$ 237128.

2. ENERGY SAVINGS (+) / COST (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	$ 10.94	1503.	$ 16443.	10.75	176760.
B. DIST	$ 4.98	5674.	$ 28257.	14.08	397852.
C. RESID	$ 4.41	4397.	$ 19391.	16.21	314324.
D. NAT G	$ .00	0.	$ 0.	13.25	0.
E. COAL	$ .00	0.	$ 0.	11.13	0.
F. TOTAL		11574.	$ 64090.		$ 888937.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)		$ 0.
(1) DISCOUNT FACTOR (TABLE A)	10.59	
(2) DISCOUNTED SAVING/COST (3A X 3A1)		$ 0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)		$ 0.

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 293349.
A IF 3D1 IS = OR > 3C GO TO ITEM 4
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)_____
C IF 3D1B IS = > 1 GO TO ITEM 4
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YRS ECONOMIC LIFE)) $ 64090.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 888937.

6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 3.75
(IF < 1 PROJECT DOES NOT QUALIFY)

7. SIMPLE PAYBACK PERIOD (ESTIMATED) SPB=1F/4 3.70

RS&H

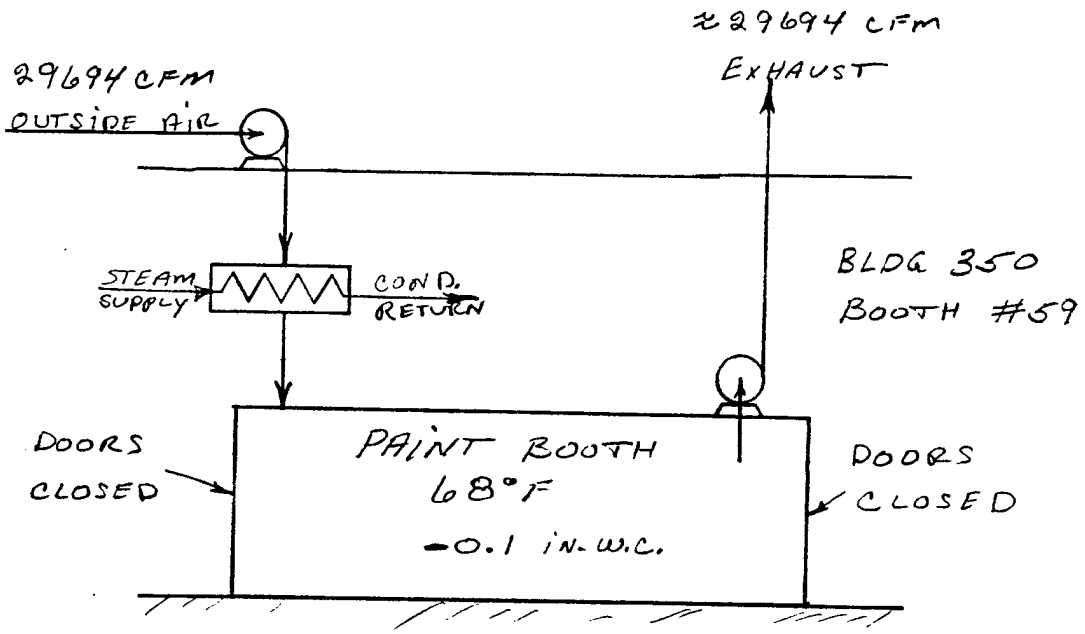
SUBJECT LEAD ECO #10 AEP NO 290-0379-001

SHEET 1 OF

DESIGNER G. Fallon DATE

CHECKER P. Hutchins DATE

ECO #10 PAINT BOOTH AIR FLOW CONTROL



CALCULATE CURRENT HEAT LOSS

ASSUME: 68°F EXHAUST TEMP
29,694 CFM (LEAD, PAINT BOOTH STUDY, BKA, 1987, Pg 94)
BOTH FANS CAN BE SHUT DOWN FOR 50% OF THE TIME.
24H/d, 5d/wk OPERATION
118,470 BTU/CFM/YR (HEAT LOSS CALC., ENCLOSED)
0.8 BOILER EFFICIENCY.

$$\text{CONSUMPTION} = \frac{118470\ \text{BTU/CFM·YR} \times 29694\ \text{CFM}}{0.8 \times 10^6\ \text{BTU/MBTU}} = 4{,}400\ \text{MBTU/YR}$$

SAVINGS #6 OIL

#6 OIL

ENERGY = 4,400 MBTU/YR X 0.5 = 2200 MBTU/YR

RS&H®

SUBJECT LEAD ECO #10 AEP NO

SHEET 2 OF

DESIGNER G.F. DATE

CHECKER DATE

ECO 10 (CONT.)

CALCULATE CURRENT ELECTRICAL CONSUMPTION

ASSUME: TOTAL ΔP = 5.0 IN w.c (2.5" IN & 2.5" OUT)

FAN & MOTOR Eff = 0.6 $\frac{2545}{6356} = 0.4$

$$\text{FAN ENERGY} = \frac{.4 \times \text{FLOW} \times \text{HEAD}}{0.6} = \frac{.4 \times 29694 \text{ CFM} \times 5}{0.6} = 99081 \text{ BTU/H}$$

$$\text{ANNUAL ENERGY} = \frac{99081 \text{ BTU/H} \times 24 \text{ H/d} \times 5 \text{ d/wk} \times 52 \text{ w/yr}}{10^6 \text{ BTU/MBTU}} = \boxed{618 \text{ MBTU/yr}}$$

SAVINGS

ENERGY ELEC

618 MBTU/yr × 0.5 = **309 MBTU/yr ELEC**

COST ELEC

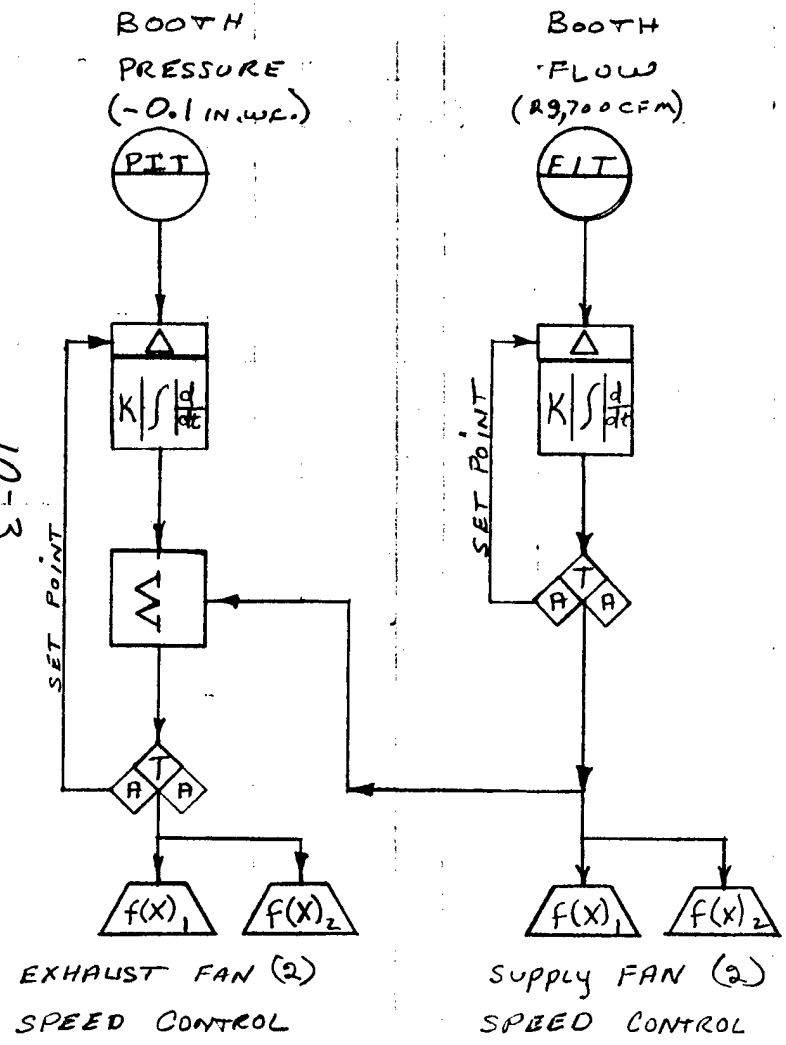
309 MBTU/yr × $10.94/MBTU = **$3382/yr ELEC.**

TOTAL SAVINGS

FROM pg 1: #6 OIL – 2200 MBTU/yr

ELEC – 309 MBTU/yr

NOTE: THE ABOVE TECHNIQUE WAS APPLIED TO LARGE PAINT SPRAY BOOTHS IN BLDGS 350 & 320 USING SPREAD SHEET SOFTWARE TO GENERATE A PAYBACK ON EACH BOOTH. THE RESULTS ARE SHOWN ON THE SUMMARY SHEET.



10-3

1) WHEN BOTH LARGE DOORS ARE CLOSED BOTH CONTROL LOOPS ARE OPERATING & CONTROLING

2) WHEN EITHER LARGE DOOR IS OPEN, BOTH FAN SPEEDS ARE REDUCED TO A MINIMUM, AUTOMATICALLY

3) THIS CONTROL SCHEME ASSURES DESIGN FLOW THROUGH THE BOOTH AT A SLIGHTLY NEGITIVE PRESSURE.

FLOW & PRESSURE WILL BE MAINTAINED REGARDLESS OF BUILDING NEGATIVE PRESSURE, SEASON OF YEAR, OR REASONABLE DEGREE OF SYSTEM CLEANLINESS.

RS&H®

SUBJECT LETTERKENNY A-D.

DESIGNER GF

CHECKER

DATE

AEP NO

SHEET 3 OF

DATE

LETTERKENNY army DEPOT
LARGE PAINT BOOTH FAN CONTROL
SUMMARY

RECOMMENDED

BUILDING NUMBER	BOOTH NUMBER	AIR FLOW (CFM)	OPERATION HOURS PER WEEEK	#6 FUEL SAVED (MBTU)	ELEC SAVED (MBTU)	COST SAVED ($/YR)	CONST. COST ($)	PAYBACK (YRS)
350	59	29694	120	2199	309.1	$13,078	$23,713	1.8
350	60	29694	120	2199	309.1	$13,078	$23,713	1.8
SUBTOTAL		59388	120	4397	618	$26,156	$47,426	1.8

BUILDING NUMBER	BOOTH NUMBER	AIR FLOW (CFM)	OPERATION HOURS PER WEEEK	#2 FUEL SAVED (MBTU)	ELEC SAVED (MBTU)	COST SAVED ($/YR)	CONST. COST ($)	PAYBACK (YRS)
320	3880	58876	40	1311	204.3	$8,762	$23,713	2.7
320	4378	29172	40	649	101.2	$4,342	$23,713	5.5
320	4379	27805	40	619	96.5	$4,138	$23,713	5.7
320	4380	27805	40	619	96.5	$4,138	$23,713	5.7
320	4381	27805	40	619	96.5	$4,138	$23,713	5.7
320	4382	27805	40	619	96.5	$4,138	$23,713	5.7
320	4383	27805	40	619	96.5	$4,138	$23,713	5.7
320	4384	27805	40	619	96.5	$4,138	$23,713	5.7
SUBTOTAL		254878	40	5674	884	$37,932	$189,704	5.0

GRAND TOTAL	#6 FUEL	4397	1503	$64,088	$237,130		3.7
	#2 FEUL	5674					

NOT RECOMMENDED

BUILDING NUMBER	BOOTH NUMBER	AIR FLOW (CFM)	OPERATION HOURS PER WEEEK	#2 FUEL SAVED (MBTU)	ELEC SAVED (MBTU)	COST SAVED ($/YR)	CONST. COST ($)	PAYBACK (YRS)
320	3930	2000	40	36	6.9	$253	$23,713	93.6
320	3931	2000	40	36	6.9	$253	$23,713	93.6

RS&H®

SUBJECT ECO # 10 AEP NO

SHEET OF

DESIGNER P. Hutchins DATE

CHECKER DATE

QRIP Calculations Using FY92 Fuel Oil Prices

Current energy use:

#6 Fuel Oil = $\frac{HLF * cfm * 4.41\#/MBtu}{0.8 \cdot 10^6}$

= $\frac{118{,}470 \frac{Btu}{cfm\,yr} * 59{,}388 cfm * 4.41}{0.8 * 10^6} = \$\ 38{,}800$

#2 Fuel Oil = $\frac{118{,}470 * 254.878 \times 4.98}{0.8 * 10^6} = \$\ 188{,}000$

Electricity = $\frac{CFM \cdot \Delta P \cdot 2545 Btu/hp\text{-}hr * hrs/yr.}{6356 * \eta_F}$

= $\frac{254{,}878 * 5 * 2545 * 24 h/d * 5 d/w * 52 w/yr}{6356 * 0.6}$

= 5307 MBtu

Cost = 5307 * 10.94 $/MBtu = $35,000

TOTAL COST = $261,800

LETTERKENNY ARMY DEPOT ENERGY AUDIT OF INDUSTRIAL FACILITIES

Operation Hrs/Day = 24

Room or Supply Air Conditions - Winter		68
Air Quantity (cfm)		1
Hour Fractions	1 AM - 9 AM	1
	9 AM - 5 PM	1
	5 PM - 1 AM	1
Operation Days Per Week		5

Temp. Range		Hours of Occurrence 2-9	10-17	18-1	Total Hours	Delta H or T	Const.	CFM	BTU/HR	Total BTU
70	74	247	237	301	785	-4	1.08	1	0	0
65	69	296	217	278	791	1	1.08	1	1	854
60	64	269	196	236	701	6	1.08	1	6	4,542
55	59	249	191	209	649	11	1.08	1	12	7,710
50	54	221	193	202	616	16	1.08	1	17	10,644
45	49	218	193	206	617	21	1.08	1	23	13,994
40	44	237	236	239	712	26	1.08	1	28	19,993
35	39	289	246	286	821	31	1.08	1	33	27,487
30	34	304	194	258	756	36	1.08	1	39	29,393
25	29	184	106	152	442	41	1.08	1	44	19,572
20	24	124	65	90	279	46	1.08	1	50	13,861
15	19	75	32	57	164	51	1.08	1	55	9,033
10	14	54	13	26	93	56	1.08	1	60	5,625
5	9	18	3	9	30	61	1.08	1	66	1,976
0	4	9	0	2	11	66	1.08	1	71	784
-5	-1	3	0	1	4	71	1.08	1	77	307
-10	-6	1	0	0	1	76	1.08	1	82	82
-15	-11	0	0	0	0	81	1.08	1	87	0
Totals		2798	2122	2552	7472					165,858

Total Operation Hours While Heating (and corrected for working days/week)	4776	118,470
Avg outdoor temp while heating (F)	45.0	

LETTERKENNY ARMY DEPOT ENERGY AUDIT OF INDUSTRIAL FACILITIES

Operation Hrs/Day = 8

Room or Supply Air Conditions - Winter 68
Air Quantity (cfm) 1

Hour Fractions
1 AM - 9 AM 0.25
9 AM - 5 PM 0.75
5 PM - 1 AM 0

Operation Days Per Week 5

Temp. Range		Hours of Occurrence 2-9	10-17	18-1	Total Hours	Delta H or T	Const.	CFM	BTU/HR	Total BTU
70	74	247	237	301	240	-4	1.08	1	0	0
65	69	296	217	278	237	1	1.08	1	1	256
60	64	269	196	236	214	6	1.08	1	6	1,388
55	59	249	191	209	206	11	1.08	1	12	2,441
50	54	221	193	202	200	16	1.08	1	17	3,456
45	49	218	193	206	199	21	1.08	1	23	4,519
40	44	237	236	239	236	26	1.08	1	28	6,634
35	39	289	246	286	257	31	1.08	1	33	8,596
30	34	304	194	258	222	36	1.08	1	39	8,612
25	29	184	106	152	126	41	1.08	1	44	5,557
20	24	124	65	90	80	46	1.08	1	50	3,962
15	19	75	32	57	43	51	1.08	1	55	2,355
10	14	54	13	26	23	56	1.08	1	60	1,406
5	9	18	3	9	7	61	1.08	1	66	445
0	4	9	0	2	2	66	1.08	1	71	160
-5	-1	3	0	1	1	71	1.08	1	77	58
-10	-6	1	0	0	0	76	1.08	1	82	21
-15	-11	0	0	0	0	81	1.08	1	87	0
Totals		2798	2122	2552	2291					49,865

Total Operation Hours While Heating
(and corrected for working days/week) 1465

35,618

Avg outdoor temp while heating (F) 45.0

10/01/91

ECO Construction Cost Estimate Calculations

ECO Name: Paint Booth Air Flow Control

ECO #: 10

1991 ECO "bare" costs (from cost estimate sheet)	
Material	$113,210
Labor	$25,630
Subtotal bare costs	$138,840
FICA Insurance (20% of Labor)	$5,126
Sales Tax (6.5% of Material)	$7,359
Subtotal	$151,325
Overhead (15%)	$22,699
Subtotal	$174,024
Profit (10%)	$17,402
Subtotal	$191,426
Bond (1%)	$1,914
Subtotal	$193,340
Contingency (10%)	$19,334
Subtotal (Construction Cost Input For LCCID *)	$212,674
SIOH (5.5% of Construction Cost)	$11,697
Subtotal	$224,371
Design (6% of Construction Cost)	$12,760
Total Project Cost	$237,131

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE

DATE PREPARED | SHEET | OF

PROJECT: ENERGY ENGINEERING ANALYSIS

LOCATION:

ARCHITECT ENGINEER: REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE
- ☐ CODE A (No design completed)
- ☒ CODE B (Preliminary design)
- ☐ CODE C (Final design)
- ☐ OTHER (Specify)

DRAWING NO.: COST FOR ONE BOOTH

ESTIMATOR: G. F

CHECKED BY: P. Hostetler

SPRAY BOOTH CONTROLS SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR PER UNIT	LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
VARI-FREQ DRIVES (1)	4	ea	185	740	1781	7124	7864
COPPER TUBING (2)	300	ft	2.42	726	.78	234	960
FLOW/INDICATING XMTR (2)	1	ea	25	25	1000	1000	1025
PRESSURE/INDICATING XMTR (2)	1	ea	25	25	1000	1000	1025
PROGRAMABLE LOGIC (2)	1	LOT		200		800	1000
LIMIT SWITCHES (1)	2	EA	3.2	164	42.00	84	148
WIRE 2-14 (2)	2	CLF	26.78	53.57	6.22	12.44	66
CONDUIT 1/2" ϕ (2)	200	LF	2.97	594	.96	192	786
CONTROL CABINET (2)	1	EA	135	135	875	875	1010
				2563		11321	13884
(1) GRAINGER							
(2) MEANS							
(3) VENDOR QUOTE							
				X10		X10	X10
For 10 booths				25,630		113,210	138,840

ENG FORM 150
1 AUG 59

(ER 1110-345-730)

PREVIOUS EDITION MAY BE USED

* U.S. GOVERNMENT PRINTING OFFICE : 1958 O—510140

(TRANSLUCENT)

NOTE: VENDOR ADVISES EQUIPMENT BELOW CAN ACCOMODATE 2 BOOTHS. THEREFORE EACH BOOTH COSTS ≈$1000.00

Cameron & Barkley Company

Flexible Manufacturing Systems
10200 Alton Box Rd., Box 26879
Jacksonville, FL 32218
(904) 757-0211

CamBar

GEORGE FALLON
REYNOLD & SMITH & HILLS
1651 SALISBURY RD.
JACKSONVILLE Fl, 32256

MODICON COMPACT 984 CONFIGURATION

		CONTROLLER HARDWARE		
1	1	PC-0984-120 1.5K Compact-984 CPU	400.00	400.00
		MISC ITEMS		
2	1	AS-MEEP-000 EEPROM Memory Card	~~200.00~~	~~200.00~~
		I/O MODULES		
3	1	AS-BADU-205 +/-10V,+/-20mA analog input module	375.00	375.00
4	1	AS-BDAP-209 115 VAC Output Module	160.00	160.00
5	1	AS-BDAU-202 1-20 mA Analog Input	435.00	435.00
6	1	AS-BDEP-209 115 VAC Input Module	115.00	115.00
7	1	AS-P120-000 120 VAC - 24 VDC Power Converter	200.00	200.00
		HOUSINGS		
8	1	AS-HDTA-200 primary subrack	165.00	165.00
9	1	AS-HDTA-201 secondary subrack - 5 module	165.00	165.00
		CABLES		
10	1	AS-WBXT-201 Bus Extension Cable	70.00	70.00
		TOTAL AMOUNT:		~~2285.00~~ $2085.00

NOTE: ALL MODICON EQUIPMENT COMES WITH A THREE YEAR WARRANTY.
PLEASE REFER TO THIS QUOTATION NUMBER. #99-910515-P004

MARK J. WALKER
SYSTEMS SPECIALIST

DEPARTMENT OF THE ARMY
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS
P.O. BOX 9005
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